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LVIII.—NOTES ON THE NATIVE PLANTS OF THE AZORES AS ILLUSTRATED ON THE SLOPES OF THE MOUNTAIN OF PICO.

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It does not seem easy to obtain a short general account of the native vegetation of the Azores. Much as has been written on the Azorean flora it is difficult to procure many data concerning the relative frequency, the mode of occurrence and associations of the native plants except from the earlier writings of Seubert, Hochstetter, Drouet, and Morelet. With some diffidence the author endeavours in this brief sketch partly to supply these deficiencies; but in this short space it will be only possible to touch very lightly on subjects which he hopes to deal with in detail in a subsequent publication. The monographs of Seubert in 1844, of Watson in 1870, and of Trelease in 1897 form landmarks in the history of the investigation of the flora. But many have laboured to supply the materials, and here we may mention Guthnick, the Hochstetters (father and son), Godman, Hunt, C. S. Brown, Sampaio, Carreiro, Machado, and Chaves.

During his two sojourns in this group, from the middle of February to the end of April, 1913, and from the middle of June to the middle of August, 1914, the author was principally engaged in investigating the altitudinal ranges of the plants. After familiarising himself with the flora in a stay of about three weeks on San Miguel (St. Michael), during which he ascended the principal mountains and enjoyed the privilege extended to him by the officials of the Municipal Museum at Ponta Delgada of consulting the herbarium, he visited Pico and remained on the mountain from the second week of March to the second week of April, 1913. During his second sojourn in the group in 1914 he stayed on the island of Pico from the end of June to the second week of August, a period of six weeks, of which the first four were passed on the mountain and the last two in the district of Caes-o-Pico and

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Praynha do Norte. The only other island examined botanically was Terceira; but this visit was confined to a single ascent of Santa Barbara, the principal summit.

Two ascents were made to the summit of Pico, 7613 ft. above the sea, namely, on April 1st, 1913, and on July 16th, 1914; whilst several ascents to altitudes of between 5000 and 6000 ft. were carried out on the north, east, south, and west sides of the peak; and, in addition, numbers of excursions were made on the lower slopes. A word may be said here on the best plan of exploring the mountain. The usual route to the summit from Magdalena by the Serra, past the Lomba, and up the south-west side of the peak is the worst that could be chosen by the botanist, since it does not bring him in contact with the upper woods. The constant employment of this route has been unfortunate for the botanical exploration of the mountain, and largely explains how it came about that it was left for the author to be the first to discover one of the most interesting plants in the Azorean flora in the form of *Arceuthobium oxycedri*, a parasite on the Juniper all round the mountain. The best plan is to examine the southern slopes from San Mattheus, whence an ascent to the summit and back can be easily made in a day, the western slopes from Magdalena, and the northern slopes from Bandeiras and Caes-o-Pico; whilst the easiest way to explore the eastern and especially the south-eastern slopes, where the upper woods attain their greatest development, is to avail oneself of a house used as a creamery and situate about 2500 ft. above the sea in the middle of the island's breadth between Caes-o-Pico and San Joao. The author's experience of a tent on the upper slopes is not such as would lead him to recommend its use to others. Though summer is naturally the most appropriate season, much can be done by the botanist on Pico in the winter months, since the woods are of evergreen shrubs and trees, and the lower snow-limit encroaches but slightly on the wood-zone.

If one excepts the Hochstetters in 1838, but few botanists seem to have made a prolonged stay on the mountain. Watson accompanied the surveying party from H.M.S. Styx to the summit in 1842 and made one or two lesser ascents. Trelease gives no idea of the length of his stay on Pico during his visits to the group in the summers of 1894 and 1896. Watson, who hardly mentions the subject of the vertical range of the plants on Pico in his monograph in Godman's book on the Azores, gives some particulars in a paper in the London Journal of Botany for 1843, but he expressly states that the conditions did not allow him to obtain exact information on the subject. Trelease does not allude to the matter. The author was therefore surprised to find that excellent accounts of the vertical distribution of plants on Pico are to be found in the writings of Seubert (1844), C. Hochstetter (1843), and Morelet (1860), and that Drouet (1866) gave many details of importance. Morelet and Drouet were two French zoologists who spent four or five months in the group in the summer of 1857 and were both much interested in the plants. The first-named made the ascent of the peak; but the latter's strength failed him, and he turned back when about half way up the mountain. However, it

is to the Hochstetters that we are most indebted for information on the subject. It was with mingled feelings of satisfaction and disappointment that the writer discovered that all his main results were in close agreement with those of the German investigators and of their later fellow-workers in this field.

The great volcanic cone of Pico, 7613 ft. in altitude, is by far the highest mountain in the Azores, none of the other islands attaining half its height. There are eight other islands in the group, and it is very remarkable that the three largest and most elevated of them have practically the same elevation, San Miguel 3570 ft., Terceira 3500 ft., and San Jorge 3498 ft., whilst the two islands next in size, Fayal and Flores, are not much lower, their heights being 3351 and 3087 ft. respectively. This is a physical feature of importance, since Pico loses the advantage of its much greater elevation on account of the predominance of lava and cinders in its upper portion; and for purposes of comparison as concerning suitable soil-conditions for vegetation we may regard only its lower 4000 or 4500 ft. Even on the island of Pico the same rule applies, since with the exception of the peak none of the other mountains exceed 3500 ft. in height. It is true that Pico Topo behind Lagens is credited in the Admiralty chart and in the accompanying Sailing Directions with an altitude of 5357 ft.; but there is an error here, the true elevation as the author ascertained being about 3300 ft.

From what has been just said we should be safe in assuming that the soil-conditions for forest-growth in the Azores cease usually at altitudes between 3000 and 4000 ft. It would seem from the early accounts of Madeira that the original forests must have extended nearly to the summit of the island, and we will take their average limits as between 5000 and 6000 ft. In the Canaries, as illustrated by Teneriffe, this limit would be generally about 7000 ft. After applying to these values for the three Macaronesian groups the correction for the difference in latitude and for the associated differences in climate we should expect to find in the Azores the Canarian forest vegetation of between 2000 and 5000 ft., or in other words the evergreen shrubs and trees of the Laurel belt. We could scarcely look for more, since the higher Pine belt of Teneriffe could not exist on the lava and cinders of the higher levels of Pico, whilst the lower coast belt with all its strange plants would be unrepresented for lack of the warm climatic conditions. The significance of this inference will become apparent in a later page; but it is by no means a novel one. It will be found in the pages of Seubert, Hochstetter, and Morelet, and is implied in the writings of Hooker.

The characteristic appearance of the great cone of Pico is that of a mountain rising with easy slopes for its lower two-thirds and then ascending precipitously to the summit. Except on the southern side it rises gently up to between 2000 and 2500 ft.; after which there is a steeper gradient to between 4500 and 5000 ft.; and then it ascends rapidly to the top. The impression formed at a distance that the lower two-thirds are vegetated, whilst the lava slopes of the upper third are barren, is verified only in a relative sense when the observer ascends the mountain.

The lower slopes are generally well vegetated up to altitudes of 4500 to 5000 ft., moorland predominating in their higher levels, that is, above 2000 ft. Woods are well developed in places, especially on the western and south-eastern sides. They are essentially formed by evergreen trees and shrubs; but on account of the persistent agency of the woodcutter through centuries the trees except when especially preserved do not usually exceed 20 ft. in height. Dwarfing of the trees and shrubs as a rule begins about 4000 ft. as the effect of deficient soil, and of exposure to the prevailing strong winds; but it is likely that in the early times forests of considerable height existed at this altitude.

Above the level of 5000 ft. the sparse vegetation of the precipitous upper third of the mountain presents a great contrast to the grassy and wooded plains below. On the crumbling lava and on the beds of cinders and coarse ashes that form its surface plants for the most part obtain a scanty hold. It is true, however, that dwarfed trees and shrubs climb the steep slopes for a few hundred feet, the scrub failing at levels short of 6000 ft.; but above that height vegetation is sparse and the plants become scarcer and scarcer as one nears the summit, some half-a-dozen reaching the terminal crater and its small cone.

Zones of Vegetation.—Before proceeding further the zones of vegetation on Pico may be here given. The arrangement does not vary materially from that of Seubert and Hochstetter, though different designations have been adopted.

(1) The Faya zone from the coast to between 2000 and 2500 ft. above the sea. The most abundant trees are *Myrica faya*, *Erica azorica*, and *Laurus canariensis*. Next in order of frequency come *Ilex perado*, *Rhamnus latifolius*, and *Picconia excelsa*, the last being now rare. *Taxus baccata*, at present almost extinct, would belong to the higher levels of this zone. The most characteristic shrubs in the same order of frequency would be *Myrsine africana*, *Vaccinium cylindraceum*, *Hypericum foliosum*, and *Viburnum tinus*. *Hedera canariensis* and a species of *Smilax* represent the climbers and *Rubus fruticosus* occurs in the undergrowth. *Osmunda regalis* is the most conspicuous of the ferns.

(2) The Juniper and Daphne zone, 2000 to 4500 ft. for the wood proper and 4500 to 5500 ft. for the scrub. The three most distinctive trees and shrubs of this zone taken in their order of frequency are *Juniperus oxycedrus* (var. *brevifolia*), *Daphne laureola*, and *Euphorbia mellifera* (Tree-Euphorbia). But *Erica azorica*, *Laurus canariensis*, *Myrsine africana*, *Ilex perado*, and *Vaccinium cylindraceum*, all of the lower zone, are here also abundant; and characteristic amongst the ferns are *Dicksonia culcita* and *Acrostichum squamosum*. *Arceuthobium oxycedri* is a common parasite on the Juniper trees.

(3) The Calluna, Menziesia, and Thymus zone, 5000 ft. to the summit. Mats of *Calluna vulgaris* and *Thymus Serpyllum* (var. *angustifolius*) predominate on these steep slopes of lava and cinders; but *Menziesia polifolia* is abundant. *Polygala vulgaris* also occurs with one or two grasses, as *Agrostis castellana*.

(4) The Upland Moors, 2000 to 4000 ft. This zone has been formed at the expense of the Juniper zone around much of the

mountain. Without differentiating here between the drier and wetter areas its most conspicuous features are the bracken (*Pteris aquilina*), the large tussocks of *Polytrichum*, and the beds of *Sphagnum*. Amongst the most frequent flowering plants are *Anagallis tenella*, *Erythraea Massoni*, *Hydrocotyle vulgaris*, *Luzula purpureo-splendens*, *Lysimachia nemorum* (var. *azorica*), *Polygala vulgaris*, *Potentilla tormentilla*, *Sibthorpia europaea*, *Thymus Serpyllum* (var. *angustifolius*), *Viola palustris*, and *Carex flava*. *Lycopodium Selago* is common, and there is an occasional scrub of *Calluna vulgaris*.

With regard to the prevailing climatic conditions it may be stated that the cloud-belt or rainy zone (2000–5000 ft.) corresponds roughly to the Juniper and Daphne zone and to the belt of the Upland moors. With reference to the higher levels between 6000 ft. and the summit (7600 ft.), although the character of the surface would primarily determine the type of plants adapted for such a rocky station, the choice would be further limited to plants capable of withstanding in a relatively dry atmosphere the fierce rays of the sun in summer, the severe cold of winter, and the stormy winds that prevail around these heights in certain seasons.

Whilst the rainfall would be much less than in the Juniper zone and in the moors, its deficiency would be partly compensated for by the heavy dews. The amount of sunshine must be considerably greater on the high levels than in the woody zone below. The mere concealment of the peak by the clouds when viewed from the coast by no means always implies that the summit is cloud-capt. Not infrequently, when the author had reached the upper limit of the cloud-belt through a driving wet mist, he found the upper third of the mountain exposed to the full glare of the sun under a clear sky and rising out of a billowy sea of clouds of dazzling whiteness like an island in the midst of arctic snows.

Although the daily range of temperature would be greater, it is very probable that the monthly means of the temperature of the air in the shade on the higher slopes of Pico would approximate those for the elevated region of Dartmoor in the south-west of England, between 1500 and 2000 ft. above the sea, a range, let us suppose, of from 33° in January to about 58° in July. Snow comes and goes on the peak at intervals during the winter and may lie for some time; but it is rarely of any depth except in the drifts. Its lower limit is generally about the 4000-ft. level; and in this connection it should be noted that on the summits of the other large islands, all of which reach a height of from 3000 to 3500 ft. above the sea, snow rarely lies. It is always winter for the people of the Western Azores whilst Pico wears its white cap. During the writer's stay on the mountain, from the second week of March to the second week of April, 1913, snow fell on at least three occasions; and for most of the time the peak was white with it. Different ascents were made up the snow-covered slopes, and in one of them (April 1st) he gained the summit.

General Account of the Vegetation.—Coming to a general account of the vegetation of Pico, and reversing the customary

order of description, we will imagine a botanist who, after alighting on the top of the mountain, descends to the coast. Upon the summit, not only at the borders of the small crater but also on the sides of its little cone (200 ft. in height), he would observe in the crevices of the bare lava-surfaces small stunted patches of *Calluna vulgaris*, *Thymus Serpyllum*, and *Menziesia polifolia*, with here and there a tuft of *Agrostis castellana*. Proceeding to descend the lava slopes on the south side he would very soon notice a few specimens of *Polygala vulgaris* growing for protection in the patches of Ling (*Calluna vulgaris*). He quickly reaches the shoulder of the mountain, a more or less level stretch of lava and lapilli, 6500–7000 ft. above the sea, where the Ling and the Thyme grow in dense mat-like beds, almost carpeting the surface in places, the first named, like the Thyme, only a few inches high. In the middle of July the Ling shows only the evidence of the last season's flowering, whilst the Thyme beds present a mass of bloom. It is on this shoulder of the mountain that St. Dabeoc's Heath (*Menziesia polifolia*) is most abundant and flowers copiously in July.

From the edge of the shoulder one looks down a precipitous slope of lava-flows, loose stones, and ashes, where the same plants occur, and often in large patches. One instinctively treads on the mats of Ling and Thyme, since they give a firmer foothold during the steep descent. There are few other plants, except the half-a-dozen above-named, that grow on these arid slopes above 6000 ft.

Very rarely one comes upon some straggler from the woods below growing from seeds dropped by birds in the crevices of a lava-cliff. Situated far above the ordinary upper limit of the rain-belt, exposed to the frosts of winter and unprotected against the intensity of the sun's rays in summer, such a plant has a hard struggle to hold its own. It was under such conditions, at an altitude of 6300 ft., that the writer found, in the middle of July, a few scattered individuals of the Azorean Holly (*Ilex perado*). Though they were scarcely over a foot high, their thick woody stocks indicated that they had been established for some years. They were in bloom; and it was interesting to notice how the axillary flowers were protected against the scorching heat of the sun's rays by the raising of the leaves which had assumed the vertical position and lay with appressed faces close to the stem. The expanding terminal leaf-buds were shielded by the same device; but more often than not it had proved ineffectual, and the buds were blackened and dead.

Our botanist has descended now to an altitude of about 6000 ft. Before he gets off the steep upper third of the mountain on to the wooded and grassy slopes of gentler gradient below he has yet to clamber down another thousand or fifteen hundred feet over old lava-flows, beds of cinders, and loose stones and boulders that when displaced bound for hundreds of feet down the mountain's side. But as he descends the conditions become a little more favourable for plant-growth. For a minute or two a driving mist envelops him and shuts all out from view. He has been in a wisp of cloud and is approaching the upper limit of the rain-belt.

Should he descend on the western side he will make but few

additions to his plant list until, at a level of about 5500 ft., he comes upon the outposts of the woods in the form of stunted bushes of the Tree-Heath (*Erica azorica*). On the eastern slopes of the mountain, where for some reason more humid conditions prevail, he will find as soon as he passes below 6000 ft. that the beds of Ling (*Calluna vulgaris*) afford protection to a variety of different plants. On these wind-swept slopes the Ling beds are only four or five inches high; and in them nestle dwarfed specimens of *Juniperus oxycedrus* flowering and fruiting as freely, though not over six inches in height, as the trees of ten or twelve feet in the woods below. On exposed peaks in this group, as may be observed on the summits of San Miguel, Terceira, etc., one often finds a dense spreading growth of stunted Junipers rising only two feet from the ground, a feature also observed and well described by Watson (p. 224); but nowhere did the present writer notice the dwarfing process so pronounced as in the case of these tiny Junipers fruiting in the Ling beds on the bleak heights of Pico. Amongst the other flowering plants that find a sanctuary in these Calluna beds at this altitude are delicate herbaceous plants like *Polygala vulgaris*, *Erythraea Massoni*, and *Lysimachia nemorum*, and hardy shrubs like *Vaccinium cylindraceum*, which, however, instead of growing nine or ten feet high, as in the woods, is here reduced to five or six inches.

The impression one forms whilst descending these steep lava slopes of the upper third of the mountain is that many of the plants characteristic of the lower levels would reach the summit, if the soil-conditions allowed it. This was also the opinion of Morelet, the French zoologist, who ascribed the penury of the higher levels to the nature of the surface and the steep angle of the slopes. The repressive influence of the fierce winds that blow around these heights during much of the year would be mainly found in the dwarfing of the trees and shrubs. That several of the plants which are at home in the upper woods between 2000 and 4000 ft. can grow at levels between 5000 and 6000 ft. is shown in their readiness to find shelter at these heights in the small craters and gulches, in the broken-down lava-caverns, and in the numerous fissures and holes. Here we find the Tree-Euphorbia (*E. mellifera*), the Azorean Holly (*Ilex perado*), *Daphne laureola*, *Myrsine africana*, *Laurus canariensis*, etc., species that are not to be seen on the wind-swept slopes near by; whilst the Juniper and Vaccinium may be observed growing four or five feet high in a pit and only four or five inches high when exposed on the surface.

But apart from these sanctuaries on the higher slopes for the more adventurous plants of the woods below, stunted specimens of the Tree-Heath (*Erica azorica*), which form the outposts of the woods, sometimes ascend, as already observed, the lower slopes of the steep upper third of the mountain to between 5500 and 6000 ft. When we get off these steep slopes at a level from 4500 to 5000 ft. the soil-conditions become more favourable. Here the Tree-Heath begins to assert its arborescent habit, and it is associated with Juniper trees of fair size, the Juniper growing well on suitable ground at these altitudes.

We now enter the cloud-belt or rainy zone which in its limits,

2000–5000 ft., rudely corresponds to the upper mountain woods. Amongst the trees *Erica azorica* is often predominant, attaining its greatest development in the middle of the belt, and growing when left undisturbed to a height of 15, 18, or even 20 ft. In the open woodland bushes of *Calluna vulgaris* may be nearly as abundant. It is between 3000 to 4000 ft. that the upper woods display their best growth. Though on account of the woodcutter's destructive influence exercised through many generations the wood is small, the height of the trees not usually exceeding 15 or 20 ft., several of them when left alone can attain, as shown below, twice this height. Amongst the other characteristic trees and shrubs of the upper woods are *Laurus canariensis*, *Myrsine africana*, *Ilex perado*, *Daphne laureola*, *Vaccinium cylindraceum*, etc.; and here thrive as solitary specimens or in twos and threes the Tree-Euphorbias (*E. mellifera*). Indications of the prevailing humidity are displayed in the filmy ferns (*Hymenophyllum tunbridgense*) growing on the trunks of the larger Junipers and Tree-Heaths. In the shade flourish ferns like *Dicksonia culcita* and *Acrostichum squamosum*; whilst *Lycopodium complanatum* is here at home. Selaginellas and Liverworts often appropriate the interior of the lava-caverns, and the large fronds of *Woodwardia radicans* clothe the sides of the narrow gulleys. *Sibthorpia europaea* abounds in shady spots, and *Trichomanes speciosum* grows in the dampest situations. When long undisturbed the woods form dense thickets difficult to penetrate. Here thrives on the branches of the Juniper trees the Loranth (*Arceuthobium oxycedri*). This parasite grows commonly on the Juniper all round the slopes of Pico at elevations of from 2000 to 4000 ft.

One of the most interesting of the plants in the upper woods is *Daphne laureola*, which is usually restricted to levels between 3500 and 4500 ft. In the woods and thickets it displays a loose straggling habit; but when, as on the northern side of the mountain, it grows exposed on the moors near their upper limit, it presents itself as rounded dense bushes three or four feet in height. But it is a plant that even here seeks protection, and it selects the dips and hollows of the moors and gives a singular appearance to the landscape.

Numerous small craters and gulches in the upper-wood zone afford refuge to plants that under ordinary circumstances are confined to the lower woods. The vegetation of the small craters on the slopes of Pico is often especially luxuriant. When, as sometimes happens, the crater or gulch is inaccessible the plants grow to unusual heights, protected against injury from men and animals. Here, in a limited space, at altitudes of about 3500 ft., one may observe nearly all the trees and shrubs of the slopes of Pico from the sea-level up to 5000 ft., not only those of the upper woods but such plants as *Myrica faya*, *Rhamnus latifolius*, and *Viburnum tinus* (Laurustinus) that are ordinarily restricted to the lower woods. In these refuges the Tree-Euphorbias (*E. mellifera*) are particularly at home, and there flourish here many herbaceous plants, such as the handsome *Euphrasia grandiflora*, a tall *Verbascum*, *Sanicula azorica*, and species of *Habenaria*.

The dominant trees of the lower woods, that is below 2000 ft.,

are *Myrica faya*, *Erica azorica*, and *Laurus canariensis*. The dominant shrub is *Myrsine africana*. But *Rhamnus latifolius*, *Vaccinium cylindraceum*, and *Ilex perado* are also frequent. The Laurustinus (*Viburnum tinus*) is absent in some places and fairly well represented in others. The "Pao branco" (*Picconia excelsa*) is now very rare, its timber being much appreciated by the islanders. However, single trees may occasionally be noticed in the woods; but as a rule it finds a refuge in some inaccessible gulch or small crater. *Osmunda regalis* may be observed at levels exceeding 1000 ft. in moist surroundings at the margin of the woods. Amongst the tree climbers are *Smilax* and *Hedera canariensis*, the undergrowth being usually formed by species of *Rubus*, *Myrsine africana*, and the Ivy just named. In the open districts *Calluna vulgaris* is abundant.

But the lower-wood zone is essentially the zone of the Faya tree. Just as the Junipers are restricted to the upper woods, so *Myrica faya* is characteristic of the woods below and rarely extends much above 2000 ft., except it finds shelter in some gulch or small crater, as before described. The trees of the lower woods that reach the coast are mainly the Faya and the Tree-Heath. Two plants range through the whole height of the mountain, *Calluna vulgaris* and *Thymus Serpyllum*. They grow not only on the old lava flows as they reach the coast, but also on the lava surface of the summit and on various kinds of soil in the intervening levels.

There remains for consideration the vegetation of the upland moors, which are generally confined between the levels of 2000 and 4000 ft. They form a belt around the greater part of the mountain, but are crossed at intervals by strips of woodland. Lying as they do within the rainy zone their conditions are nearly as moist as those of the upper woods, and they largely usurp their place. They are used as pasture land for cattle, the lower portions being under private ownership; whilst the upper parts marked off by a high wall, usually about 3000 ft. above the sea, are known as the Baldios or Common-lands. These upland moors, which doubtless have been greatly extended by deforestation since the colonisation of the group, are characteristic of all the larger islands. In the association of their plants they display a striking resemblance to Dartmoor. Their surfaces on the slopes of Pico are often marked by linear copses of the Tree-Heath, presenting a variety of strange patterns, which look, from a distance, like huge hieroglyphs on a light green ground. Two objects have here been served. In availing himself of the natural growth of the trees the landowner has so trimmed and directed the growth of the original copse that, at the expense of as little ground as possible, he obtains shade for his cattle in summer and shelter from the cold winds in winter. In the other case, whilst clearing his land he has preserved the heath-trees when they are frequent near his boundary lines, and has allowed them to propagate themselves only on the borders of his property, the result being that his land is partially inclosed in a living tree-fence.

Except on the south side, where the mountain rises steeply from the coast to its summit, these upland moors have usually an easy

slope. The bracken (*Pteris aquilina*) and the tussocks of *Polytrichum* give a character to their rolling grassy surfaces. It is a pleasure to tread their springy turf after the rough descent of the precipitous scantily vegetated lava slopes above; and if it is summer the multitude of herbaceous plants in bloom will delight the eye. One may on the western side distinguish between the boggy lower areas, where *Sphagnum* flourishes, and the relatively drier upper levels where peat-mosses do not live; but more often the differentiation is not to be made, and one may stumble on a bed or a pocket of *Sphagnum* without much warning. On the drier ground thrive *Erythraea Massoni*, *Lysimachia nemorum* (var. *azorica*), *Luzula purpureo-splendens*, *Menziesia polifolia*, *Polygala vulgaris*, *Potentilla tormentilla*, and *Thymus Serpyllum*, with an occasional scrub of *Calluna vulgaris*. *Sibthorpia europaea* conceals with its foliage the shady side of pits and holes, but with the Lysimachia it is almost as common in the wetter areas. Terrestrial orchids (*Serapias*, *Habenaria*) are not infrequent, and the turf is dotted with single tufts of *Lycopodium Selago*.

The wetter areas, when of any size, are essentially *Sphagnum* moors, and the *Polytrichum* tussocks are here more numerous and larger (1½–2 ft. high, 2–3 ft. across), the peat-moss being often closely associated with them in their growth. *Anagallis tenella*, *Hydrocotyle vulgaris*, and *Viola palustris* grow in great abundance, and amongst the Carices *Carex flava* is the most common and sometimes almost monopolises the ground. It may be doubted whether the Bog Pimpernel (*Anagallis tenella*) exists in greater profusion in any part of its range than on the island of Pico. The writer has walked for miles on the mountain moors to the east of the peak, treading on its flowers at almost every step. In the tussocks, or rather hummocks, of *Polytrichum* nearly all the flowering plants of the wet moor in turn find a home, but *Hydrocotyle vulgaris* is most frequently to be noticed growing in their midst. The tussocks of *Polytrichum* by becoming confluent form in places dense beds nearly appropriating the ground. This is to be noticed on the northern side of Pico, where the moor-vegetation begins to ascend the steep upper third of the mountain.

The *Sphagnum* growth is in some localities very extensive, as on the south-west side of the mountain between the Serra Gorda and San Mattheus. For 1½ or 2 miles from the Serra the soil is stoneless and peaty, and *Sphagnum* forms dense growths, a foot high or more, around the bases of the shrubs of *Erica azorica* that here clothe the surface. The bushes, in fact, seem to grow out of Sphagnum tussocks. The significance of this association is not very obvious. Tansley, in his "Types of British Vegetation" (1911, p. 235), describes similar growths of *Sphagnum* around the bases of bushes and on the stools of *Phragmites* in the fen formation of East Norfolk, and he considers that the acids secreted by the peat-mosses would be neutralised by the alkaline ground-waters. In the coastal swamps of the Carolina region a large fern, *Woodwardia virginica*, grows out of low *Sphagnum* tussocks which are surrounded by standing water (Harshberger's "Phytographic Survey of North America," 1911, p. 441). The Pico locality, it should be noted, lies in the midst of a region of basic lavas

rather over 2000 ft. above the sea. In midsummer its surface is but slightly moist and large masses of dead peat-mosses are seen. In winter the ground would doubtless be very wet.

Here and there water collects in depressions of the boggy ground on these upland moors. Around the edges of the pools grow *Littorella lacustris*, *Peplis portula*, *Carex stellulata*, *Scirpus cernuus* and *Scirpus multicaulis* in proliferous condition. In the water thrive *Callitriche aquatica*, *Potamogeton polygonifolius*, and *Scirpus fluitans*. Around the large lakes lying to the east of the peak in the mountainous region behind Caes-o-Pico, Praynha do Norte, and Santo Amaro, and elevated between 2500 and 3000 ft. above the sea, one can sometimes recognise a succession of formations. Whilst the *Potamogeton* above named occupies the shallows, *Scirpus fluitans* monopolises the soppy ground at the lake's border, and outside this is a broad belt of *Sphagnum* where *Scirpus multicaulis*, *Carex flava*, *Anagallis tenella*, and *Hydrocotyle vulgaris* thrive. Sometimes a tall form of *Scirpus palustris*, two feet high, grows in the shallows.

Littorella lacustris and *Isoetes lacustris* (var. *azorica*) are common around some of these large mountain-lakes. Both display two forms, a dwarfed form on the exposed mud-flats and a large form with long cylindrical leaves, the latter growing either in the deeper water (*Isoetes*) or where the water just covers the ooze at the lake's margin (*Littorella*). Whilst the dwarfed plants of *Littorella lacustris* were well in flower in the end of July, the large plants were showing the flower buds; the latter possess leaves, six to nine inches long, which lie prostrate in the water and not erect as is sometimes described. It was evident that the floating growths of *Potamogeton polygonifolius* are inimical to the growth of the large forms of *Littorella lacustris* and *Isoetes lacustris*. They are rapidly extending in the ponds and lakes of this island, and not improbably will ultimately exterminate the last-named species. Almost all of the above-named aquatic and subaquatic plants flourish in one or other of the numerous small crater-lakes in the island, which, it may be added, have often *Sphagnum* borders.

All the plants dealt with in the foregoing pages would be regarded as indigenous. The native flora of the Azores was probably extremely limited. The group has been colonized for more than four centuries, and during that period multitudes of species have been introduced, either by accident or by intention. Trelease considers that most of the existing plants have been introduced largely through human agency since the discovery of the islands (p. 87); and one cannot be many weeks in the group without recognising the correctness of this opinion. Watson's list of 439 flowering plants was increased by Trelease to about 560; but I should imagine that the original flora did not comprise 200 species and that the plants that gave their impress to the vegetation did not amount to a hundred. The matter cannot be treated here; but by restricting the field of discussion to the native plants it is evident that we assume a very great reduction in the size of the flora that has often been described as indigenous to the Azores.

Watson, though he did not elaborate the point just touched

upon, gives some valuable suggestions (p. 268) regarding the composition and general nature of the original forests of the archipelago. We may be allowed here to emphasise his opinion that evergreen shrubs and trees, with ferns and mosses, formed the principal features of the vegetation, and that "a close forest of evergreens must have formerly covered the ground." After a few weeks in the islands, the present writer found himself unconsciously restoring the evergreen woods that once predominated in the group. Except as concerns the genera *Taxus*, *Euphorbia*, *Smilax*, and *Rhamnus*, his list corresponds with that of Watson, though only the species regarded as most characteristic are below named.

Amongst the trees, *Erica azorica*, *Laurus canariensis*, *Myrica faya*, and *Juniperus oxycedrus* would have been most frequent. *Ilex perado* would have been well represented, together with *Picconia excelsa* and *Taxus baccata*, both of which are rare in the existing forests. *Rhamnus latifolia*, a sub-evergreen, doubtless took its share, and the Tree-Euphorbia (*E. mellifera*) was probably more frequent than it is at present. Amongst the evergreen shrubs, *Myrsine africana*, it is likely, took a leading part; *Vaccinium cylindraceum* was abundant; and whilst *Daphne laureola* flourished in the upper woods, *Hypericum foliosum* was frequent in the lower woods. The Laurustinus shrub (*Viburnum tinus*) was well represented in places, and climbers like *Smilax canariensis* and *Hedera canariensis* were conspicuous. One cannot, however, pursue this subject further here, and brief reference will now be made to another feature of the original evergreen forests.

It is apparent from the old Portuguese and other authorities of the 16th century quoted by Walker, such as Fructuoso, Cordeiro, and Linschoten, that the islands were once heavily timbered. Fructuoso speaks of the dense and lofty woods of cedars (*Juniperus*), fayas (*Myrica faya*), and laurels on the slopes of the valley of the Furnas in San Miguel in the 16th century. Linschoten writes of the abundance of the "excellent and princely wood" of the "teixo" (*Taxus baccata*) on Pico in the same century. Walker also quotes the works of the old historians to the effect that, as on Terceira, the timber of the cedar (*Juniperus*, the "cedro" of the present islanders) was often employed for the beams and roofs of churches. The last record, he says, of these "magnificent" Azorean cedars belongs to the first part of the 17th century; and nearly all the old timber trees of the Azores seem to have disappeared before the close of that century. He mentions the occurrence of large trunks of the cedar and other trees lying buried in volcanic ashes on San Miguel; and in this connection Trelease (p. 169) remarks that "large logs, apparently of this species (*Juniperus*), occur deeply buried" under volcanic debris in one of the large craters of that island. "From the boles occasionally unearthed at the Seven Cities and Furnas (writes Walker, concerning San Miguel, p. 25) there is little doubt that these splendid trees, on its first discovery, inhabited a high belt of country extending east and west along the island." According to the same authority, specimens of the Tree-Heath and of the Faya of giant proportions and in a state of lignite have been

exposed in the ravines of San Miguel, pp. 219, 220. We also learn from him that "immense cedar trees" are occasionally found embedded in the ravines and valleys of Terceira (p. 253). One hears of the occurrence in the other islands, such as Flores, Pico, and San Jorge, of buried trunks of "cedar" of huge size.

The whole subject of these buried trees in the Azores requires systematic investigation; but there can be little doubt that the group possessed an abundance of excellent native timber in the early centuries of its occupation, and that it has none now. We would be unable to find in our own days any native trees large enough to supply timber for roofing churches. Men, goats, and cattle have been active agents in deforesting these islands for four hundred years and more. Pico, as we learn from Walker (p. 84), was at one time "densely covered with timber of large size." Except when specially preserved, it would be difficult to find trees more than 20 ft. high and more than thirty years old on that island now.

One can scarcely be surprised that authors, judging the past from the present, should write depreciatingly of the original forests of the Azores. Godman characterises them as "underwood" (p. 4); and Watson, when referring to their features (p. 268), speaks of the "frutescent and sub-arborescent" species and of the "shrubs and small trees" of which they were composed. Correcting Seubert's description of *Myrica faya* as a tall tree, he says that, according to his recollection, it would be more truly described as a dense bush (p. 224). He might have seen them 35 to 40 ft. high in the gardens around Ponta Delgada.

It was the fact just mentioned that led me to investigate the subject on the island of Pico. Land is there valued for the wood upon it, and it is profitable for the owner to leave his land undisturbed for many years. The great demand for wood for firing and other purposes usually prevents this being done; but in two of these "preserves" at the back of Magdalena, where the larger wood was made up entirely of *Myrica faya*, *Laurus canariensis*, and *Erica azorica*, the trees of the two first named commonly attained a height of from 35 to 40 ft. and a diameter of from 12 to 15 inches, and those of *Erica azorica* a height of 25 ft. and a diameter of 11 or 12 inches. The Faya trees occasionally exceeded 40 ft., the maximum being 50 ft.; whilst the Tree-Heaths at times must have measured between 30 and 35 ft. in height.

It does not appear, however, that the present Juniper trees anywhere approach the size attributed to the "cedros" of the original forests. On Pico, a height of 15 or 16 ft. and a diameter of 15 to 18 ins. (in a very few cases 20 ins.) represent my maximum measurements. Rarely does the Azorean Juniper grow straight, the trunk being twisted and bent. It is likely that the finest specimens exist on the uplands of San Jorge. Judging from a photograph, kindly taken in my interest by Colonel Chaves, they might there attain a height of 18 or 20 ft. Mr. Ogilvie-Grant mentions the "grand old Juniper trees" on the higher levels of the same island (Novitates Zoologicae, xii. 1905).

Affinities of the Native Flora.—A few concluding remarks may now be made on the general affinities of the native flora of the

Azores as illustrated in the woods and in the mountain moors. Whilst the predominant plants of the moors are in nearly all cases European species that do not occur in either Madeira or the Canaries, most of the characteristic shrubs and trees of the woods are non-European, and either exist in the other two groups or are represented there by closely related species. Although the ancestors of these forest trees and shrubs were originally derived from Europe, it was probably at an earlier date than the moor plants which are still in touch with their European home. The forest plants concerned include, amongst others, *Ilex perado*, *Rhamnus latifolius*, *Vaccinium cylindraceum*, *Erica azorica*, *Picconia excelsa*, *Laurus canariensis*, *Euphorbia mellifera*, and *Myrica faya*. The moor plants comprise species of both wet and drier stations, and include *Viola palustris*, *Polygala vulgaris*, *Potentilla tormentilla*, *Hydrocotyle vulgaris*, *Calluna vulgaris*, *Menziesia polifolia*, *Sibthorpia europaea*, *Lysimachia nemorum*, *Anagallis tenella*, etc.

There are, however, indications that the Azorean native woods, non-European as they are as regards several of their shrubs and trees, have preserved in the case of some species the European connection. Interesting evidence is supplied by the presence there of *Daphne laureola*, *Viburnum tinus*, *Juniperus oxycedrus*, and *Taxus baccata*, all but the Juniper, which is also a native of Madeira and the Canaries, being alone represented in the Azores in Macaronesia. With the exception of *Taxus baccata* all grow in Marocco on the slopes of the Great Atlas at altitudes of 4000 to 6500 ft.; and since no other trees and shrubs of the Azorean woods are named in Ball's list of the plants of that region (Hooker's "Marocco," p. 425), it would almost appear that the Azores may have received in a recent age these species of *Daphne*, *Viburnum* and *Juniperus* by way of the Atlas Mountains. But it would seem that similar recent accessions to the Canarian flora may have been received from the same source. Thus, in *Daphne gnidium* we have a European species which is associated on the slopes of the Great Atlas with *Daphne laureola;* in *Viburnum rigidum* a species related to the Mediterranean and North African *V. tinus* through its Azorean form (Trelease, p. 118); and in *Juniperus oxycedrus* also a Great Atlas species.

This Juniper has developed in the Azores a short-leaved form, which is by some regarded as a distinct species. But observation of many living trees in that group convinced me that great variation prevails in this character, and that Watson's half-doubt about the validity of the specific distinction in *Juniperus brevifolia* is more than sustained. *Taxus baccata*, which has been almost exterminated by the islanders for the sake of its timber, still exists sparingly in the mountains at the back of Caes-o-Pico and San Roque in the island of Pico. We learn from Trelease that it formerly grew in workable size on Flores and Corvo and was exported as a source of royal revenue. The Pico islanders are familiar with the tree by reputation, though very few could have seen it growing in their woods. A lake in the mountains behind San Roque is still known by some as the "Lagoa das Teixas" (*Taxus*), though the tree must be almost extinct there now.

According to Walker the old writers of the 16th century described this tree, under the name of "Teixo," as abundant on Pico. In the Macaronesian archipelagos *Taxus baccata* has been only recorded from the Azores, and probably its seeds were originally brought by birds from South-western Europe.

A very singular African connection is displayed in the existence in the Azorean woods of *Myrsine africana*, one of the most predominant of the shrubs. It is a native and often a mountain plant of Inter-tropical and South Africa, Abyssinia, Arabia, and Central Asia. It is not even at home in Madeira and the Canary Islands, its nearest habitats being in Angola and Abyssinia. Its small berries are well suited for dispersal by frugivorous birds; but its isolated occurrence in the Azores is one of the puzzles of the flora.

It thus appears from the preceding remarks that, whilst the native plants of the upland moors of the Azores are European, and as a rule not found in either Madeira or the Canary Islands, those of the woods, whilst mainly non-European, are largely Canarian and Madeiran. But these shrubs and trees of the woods are Canarian in a special sense, since, with the exception of the Juniper, they are confined to the middle zone or Laurel belt of Teneriffe, which lies between the levels of 2000 and 5000 ft. The parallel between Pico and Teneriffe would be more complete in this respect if the soil-conditions of the upper part of the Azorean mountain had permitted the development of an extension of the Juniper belt far up its slopes above the present level of the woods, just as *Juniper oxycedrus* once thrived on Teneriffe above the Laurel belt. But on Pico the differentiation of the Juniper from the wood zone has been, for the reason just given, incomplete.

But the cone of Pico lacks much that is characteristic of the Peak of Teneriffe. It lacks the Pine belt on its upper slopes because the soil-conditions above the rain or cloud zone are unfavourable for the growth of coniferous forests. It lacks the lower or African zone and all its strange-looking plants, such as the Cactoid Euphorbias, the Dragon Trees (*Dracaena draco*), and *Plocama pendula*, as well as the large Sempervivums of the coastal precipices, the result mainly of climatic differences associated with a latitude some ten degrees farther north.

But to return to the similarities between the Laurel belt of Teneriffe and the woods of the Azores, there is a wider outlook of the question, such as Hooker presented in his "Lecture on Insular Floras" (1866) and in his discussion of the Canarian flora in his later book on Marocco (1878). He regarded the trees and shrubs of the peculiar American genera existing in the Canaries and in Madeira as the wreck of an ancient flora that existed in Europe in Miocene times and has since been driven out of that continent by the northern and eastern floras that now replace it there.

But presumably the Canary Islands and Madeira hold the wrecks of many floras. They possess a number of peculiar genera and representatives of genera now exclusively American as well as an abundance of peculiar species, all pointing to an age preceding that indicated by the non-European trees and shrubs that are common to all the three Macaronesian groups. It is probable that both the Canaries and Madeira are far older than the islands of the

Azores, which possess no genus of their own and relatively few peculiar species that are beyond suspicion. The waves of migrating plants that have in successive ages passed over this portion of the globe left their wash on the Canarian and Madeiran groups before the Azorean area became available for plant-stocking. If the proportion of peculiar species in the Azores amounts to one-tenth, it would be about one-sixth in .Madeira, and one-third in the Canaries. It is, indeed, curious that the group that is almost in touch with the African continent displays the greatest evidence of differentiation, and that the group that lies almost in mid-Atlantic displays the least.

As is remarked by Hooker in his lecture on Insular Floras (p. 15), but few of the Azorean plants are suggestive of such revolutionary changes as are indicated in the Canarian and Madeiran floras. The flora, if we except *Myrsine africana*, *Campanula Vidalii*, and one or two others, contains but few "problem" plants; whilst the Canaries and Madeira present a host of difficulties of this kind. As Wallace recognised, in his "Island Life" and in his "Darwinism," there can be no hesitation in attributing the plant-stocking of the Azores to the existing agencies of dispersal. In the Canaries quite other questions are raised than those of dispersal, questions that may carry us far back in geological time. In the Azores, on the other hand, the plants present us with a story of to-day for the upland moor and of yesterday for the mountain wood.

SUMMARY INDICATING THE LEADING CONTENTS OF THE PAPER.

The author endeavours to describe briefly some of the most conspicuous features of the native vegetation of the Azores as illustrated on the mountain of Pico. In so doing, he directs attention mainly to the vertical distribution of the plants.

After pointing out that for purposes of comparison with Madeira and the Canaries the Azores should be regarded as presenting conditions for forest-growth up to levels of 3000 to 4000 ft. (p. 307) he gives the zones of vegetation (p. 308), (1) the Faya zone, up to 2000 or 2500 ft.; (2) the Juniper and Daphne zone, 2000–4500 ft.; (3) the *Calluna*, *Menziesia* and *Thymus* zone, 5000 ft. to the summit; (4) the Upland moors, 2000–4000 ft.

A reference to the climatic conditions (p. 309) is followed by a general account of the native vegetation of the mountain (pp. 309–315). Beginning with that of the summit and of the higher levels (p. 310), he then describes in their order the plants of the upper woods or Juniper and Daphne zone (p. 311), of the lower woods or Faya zone (p. 313), and of the Upland moors (p. 313).

After alluding to the relatively small number of indigenous plants as compared with introduced plants (p. 315), the composition of the forest of evergreens that clothed the islands at the time of their discovery is discussed (p. 316), and the early writers are quoted in support of the view that the trees of the original woods were of far greater size than at present. It is then shown that although in the existing woods the trees are of small size on account of the persistent agency of the woodcutter,

they attain respectable dimensions when allowed to grow undisturbed (p. 317).

With regard to the general affinities of the Azorean flora it is remarked that, whilst the plants of the upland moors are in the mass European species that do not occur either in Madeira or in the Canaries, most of the characteristic trees and shrubs of the woods are non-European and either exist in the other two groups or are represented there by closely related species (p. 317). It is suggested, in passing, that the European element in the woods was mainly derived by way of the Atlas Mountains (p. 318). The woods of the Azores, as regards their component trees and shrubs, are to be compared with the "laurel belt" that forms the middle zone of vegetation on the slopes of Teneriffe. The lower African zone and the higher region of pines as displayed on that mountain are not to be found in the Azores, their absence being due to lack of the requisite climatic conditions in the first case, and to want of suitable soil conditions on the high levels of Pico in the second case (p. 319).

Finally, it is shown that the marked endemism of the Canarian and Madeiran floras is but slightly displayed in that of the Azores. The revolutions in plant-life which are suggested by the presence in the other two groups of representatives of genera now exclusively American cannot be predicated for the Azores. On the contrary the Azorean plants supply us with a story of to-day for the upland moor and of yesterday for the mountain wood.

PRINCIPAL WORKS QUOTED ON THE FLORA OF THE AZORES.

(*a*) "Ubersicht der Flora der azorischen Inseln," by M. Seubert and C. Hochstetter, in Wiegmann's "Archiv für Naturgeschichte;" jahrg. ix. band i.; Berlin, 1843; accompanied by a large coloured plate illustrating the zones of vegetation on Pico.

(*b*) "Flora Azorica," from the collections and notes of C. Hochstetter and his son, by M. Seubert, Bonn, 1844.

(*c*) "Iles Açores (L'Histoire Naturelle)," by A. Morelet, Paris, 1860. The author was a zoologist who was also interested in the flora.

(*d*) "Catalogue de la Flore des Iles Açores," by H. Drouet, Paris, 1866. The author, like Morelet his companion, was a French zoologist.

(*e*) "Natural History of the Azores," by F. du C. Godman, London, 1870. It contains Watson's monograph on the flora.

(*f*) "Botany of the Azores," by H. C. Watson, appearing in Godman's work, above-named.

(*g*) "Azores," by W. F. Walker, 1886. One of the most important general works on the Azores.

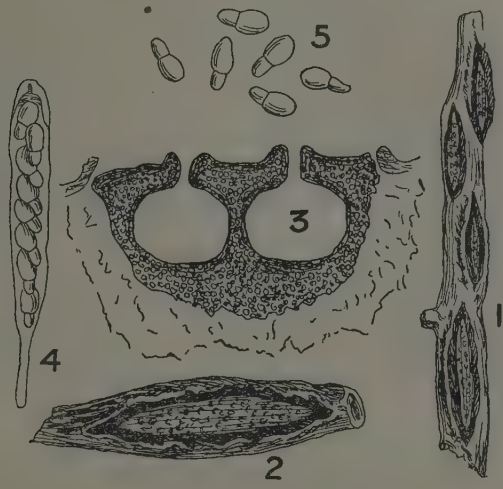
(*h*) "Botanical Observations on the Azores," by W. Trelease. 8th report of the Missouri Botanical Garden, St. Louis, 1897.

LIX.—BLACK-KNOT OF BIRCH.

G. Massee.

A disease attacking birch trees is just now much in evidence in some parts of Scotland, and is probably widely distributed in this country, as specimens collected at Eltham in Kent, and in Yorkshire are now in the Kew herbarium. The disease is also present in Sweden, Switzerland, Finland and Germany. A fungus called *Plowrightia virgultorum*, Sacc., is the cause of the disease. The genus *Plowrightia* includes some destructive parasites, amongst others *P. ribesia*, Sacc., producing Gooseberry black-knot, not uncommon in this country, and *P. morbosa*, Sacc., the cause of the dreaded black-knot disease of plum and cherry trees in the United States and Canada. The last named disease is at present unknown in Europe. Shoots and branches of birch from one to four years of age are attacked, the fungus gaining an entrance through the lenticels. After infection a black stroma is gradually formed which extends completely through the thickness of the cortex, but is checked when it reaches the wood. The diseased patches are narrow, and elongated in the direction of the long axis of the branch, varying from a quarter of an inch to an inch in length by two lines to a quarter of an inch in breadth. During the first season of infection the surface of the stroma is flush with that of the shoot, and is covered with a dense blackish olive layer bearing myriads of very minute conidia. At a later stage the stroma increases in thickness, becomes hard and carbonaceous, and produces the higher or ascigerous form of fruit. As the branch continues to increase in thickness after infection, the patches of fungus become surrounded by a wall of tissue, and eventually present the appearance of blackened patches occupying the bottom of a more or less deep, elongated pit. Owing to the facility for infection, due to the lashing together by wind, of healthy and diseased branches, the points of infection are usually numerous on each shoot, and are readily distinguished by the gouty or knotted appearance presented. The first indication of disease is the wilting and yellowing of the leaves, followed by the death of the branch. Trees that have been diseased for some time present a peculiar and characteristic appearance. Owing to the death of the terminal shoot, numerous lateral branches are produced, the lead of each one in turn being killed by the fungus; a repetition of this process results in the production of more or less dense tufts of stunted branches bearing a superficial resemblance to "witches' brooms."

The only means that can be suggested for the arrest of this disease is the removal of infected branches.



Description of the Figures.

1. Portion of diseased branch; natural size.
2. Portion of diseased branch; × 3.
3. Section through stroma, showing two perithecia; × 100.
4. Ascus containing eight spores; × 300.
5. Free ascospores; × 400.

LX.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECADES LXXXI.-LXXXII.

801. **Talauma singapurensis,** *Ridley* [Magnoliaceae-Magnolieae]; *T. gigantifoliae* et *T. lanigerae*, Hook. f., affinis, sed ab illa petiolis longioribus, ab hac foliis majoribus, ab utraque pistillis glaberrimis differt.

Frutex validus, 6 m. altus. *Folia* magna, rigide coriacea, oblanceolata, acuminata, versus basin angustata, 37 cm. longa, 11 cm. lata, adulta glabra costa hirsutula excepta, nervis 14–15-paribus subhorizontalibus, reticulationibus in utraque pagina conspicuis, petiolo 2·5–4 cm. longo basi incrassato. *Pedunculus* validus, 10 cm. longus, brunneo-sericeo-hirtus. *Sepala* ovata, lanceolata, brunneo-sericeo-hirta, 4 cm. longa, 2 cm. lata. *Petala* glabra, lanceolata, acuminata, acuta, coriaceo-carnosa, alba, 6–7 cm. longa, 3·5 cm. lata. *Staminum* filamenta brevia; antherae lineares, appendice acuminato-acuta. *Pistilla* glabra. *Fructus* 7 cm. longus, lignosus. *Carpella* 3 cm. longa, parte

basali 2 cm. lata, pustulata, superne parce lenticellata, stylo ad apicem convoluto. *Semina* in utroque carpello 2, irregulariter elliptica vel ovata, complanata, pallide brunnea, laevia.

Malay Peninsula. Singapore: Angmokio; Bukit Mandai Road, in forest swamps, *Ridley* 3656: Chan Chukang, *Ridley* 5091.

In its large stiffly coriaceous leaves, and large acuminate flowers this handsome shrub resembles *T. gigantifolia*, Miq., of Borneo and Sumatra, but from this, which is described as a tree, it differs in its petioles being much longer and the pistils perfectly glabrous at all stages. From *T. lanigera*, Hook. f., it differs in its larger flowers and much larger leaves, and also in its perfectly glabrous pistils, which in both of these species are covered with dense yellow silky hairs. The plant appears to be confined to the south of the peninsula, where it occurs in low swampy forest. *T. lanigera*, Hook. f., a small tree, occurs in Penang, where Curtis collected it, in Malacca (Griffith), and at Larut in Perak. A specimen in Herb. Kew, labelled "Singapore, 1867," by Maingay, is the only record from the island, and perhaps is wrongly localised.

802. **Goniothalamus caudifolius,** *Ridley* [Anonaceae-Mitrephoreae]; *G. tenuifolio*, King, affinis, sed foliis basi rotundatis, nervis prominulis supra depressis, floribus minoribus distinctus; a *G. Kunstleri*, King, quoad nervationem subsimili foliis multo minoribus et floribus minoribus differt.

Frutex, ramis gracilibus velutino-pubescentibus. *Folia* elliptica, acuta vel saepe caudata, apice obtusa, basi saepissime rotundata, membranacea, glabra, 11·5 cm. longa, 2·5 cm. lata, nervis 7–10-paribus supra depressis subtus elevatis, petiolo 3 mm. longo crassiusculo glabro. *Flores* singuli, extra-axillares; pedicelli crassi, 6 mm. longi. *Sepala* ovata, acuta, basi rotundata, lata, membranacea, nervosa et reticulata, hirta, praesertim in marginibus. *Petala* exteriora lanceolata, in utraque pagina pubescentia, 1·5 cm. longa, interiora ovata, obtusa, conniventia, 0·7 mm. longa, pubescentia. *Stamina* numerosa, angusta, linearia, appendice connectivi late conico obtuso. *Ovaria* plura, glabra.

Malay Peninsula. Perak; Pondok Tanjong, *Burn-Murdoch*.

This species belongs to the series of *Goniothalamus* with membranous nerved and reticulated sepals, and in general form of leaf and nervation resembles *G. Kunstleri*, King; but the leaves of that species are more than twice as large and the flowers also are larger, and the petals shorter in proportion to the sepals. The appendage of the stamen is shorter and broader. The specimen is in poor condition, and the only nearly complete flower may not be fully developed.

803. **Hibiscus setinervis,** *Dunn* [Malvaceae-Hibisceae]; *H. anguloso*, Steud., affinis, foliorum nervis setosis nec tomentosis distinctus.

Herba elata, foliosa, vix ramosa, ubique dense setifera. *Folia* (3–) 5- (7–) lobata, circumscriptione rotundata vel ovata, cordata, 10–13 cm. longa, supra setulosa, subtus in nervis setosa, aliter

glabra; lobi triangulares, 3–6 cm. longi, acuminati, acute serrati; petioli foliis aequilongi. *Flores* racemosi, 4–6 (–10) cm. longi, purpurei; pedicelli floribus aequilongi, capsulis bis longiores; bracteolae 5, lanceolatae, 2–3 (–5) cm. longae, setiferae, primum marginibus cohaerentes sed flore crescente plus minusve disjunctae. *Calyx* spathaceus, deciduus, bracteolis brevior. *Corolla* generis. *Capsula* 4 cm. longa, ovata, acuminata, setosa. *Semina* globosa, 3·5 mm. diametro, lineis puberulis numerosissimis concentricis notata.

India. Madras Presidency: Malabar Division; Baba Budan Hills, *Law;* Brahmagiri Hills, 1350 m., *Beddome;* Wynaad, *Beddome;* Coimbatore Division; Nilgiris, *Wight* 205 (Kew Distr. No.), *Beddome*; Naduvattam, *Lawson*: Madura Division; Pulney Hills, *Wight* 203 (Kew Distr. No.); Pulney Hills, 1500 m., *Saulierè* 409.

804. **Reevesia formosana,** *Sprague* [Sterculiaceae-Helictereae]; affinis *R. thyrsoideae*, Lindl., a qua foliis non acuminatis valde obtusis, inflorescentia densa tomentella, pedicellis brevioribus, ramulis hornotinis stellato-pubescentibus differt.

Ramuli exstantes in toto ad 13 cm. longi, teretes, hornotini 3·5–6·5 cm. longi, 2–2·5 mm. diametro, annotini glabrati, laeviusculi, satis pallidi, 2·5–4 mm. diametro. *Folia* obovato-oblonga vel ovato-oblonga, basi rotundata vel inconspicue subcordata, apice obtusissima vel breviter late obtusissime cuspidata, 3–7·5 cm. longa, 1·5–3 cm. lata, juventute stellato-puberula, praesertim in nervis, demum glabra; petioli 1–1·5 cm. longi, juventute tomentelli, demum pubescentes. *Thyrsi* densi, 4–5 cm. longi, ubique fulvo-tomentelli; pedicelli circiter 3 mm. longi, vix 1 mm. infra apicem articulati. *Calyx* obconico-campanulatus, vix 5 mm. longus, extra tomentellus; tubus intus glaber; lobi irregulares, late ovati, usque ad 1 mm. longi, intus stellato-pubescentes. *Petala* spathulata, circiter 7 mm. longa. *Columna* staminalis 1·3–1·4 cm. longa.

Formosa. South Cape, *Henry* 1970.

805. **Impatiens Allanii,** *Hook. f.* [Geraniaceae-Balsamineae]; a speciebus aliis birmanicis petalis lateralibus pro floris magnitudine maximis differt.

Herba humilis, glaberrima, erecta, paucifoliata, grandiflora, caule gracili laxe ramoso, internodiis elongatis. *Folia* opposita, ovata, apice acuminata, minute serrulata, basem versus rotundatam cuneatamve ciliata, 3–5 cm. longa, submembranacea, lacte viridia, subtus pallida, nervis lateralibus utrinque 5–6, petiolata; glandulae intrapetiolares deficientes. *Inflorescentiae* in axi primaria ramisque, pedunculatae, pauciflorae; pedicelli graciles, 1–2 cm. longi; bracteae lanceolatae, longe acuminatae, 3–4 mm. longae, membranaceae, persistentes?; flores ampli. *Sepala* duo lateralia lanceolata, longe acuminata, 8 mm. longa, membranacea, straminea, 3–nervia; sepalum posticum vexillare (vexillum) expansum, late trigonum, lateribus rotundatis in apicem acuminatum productis, 11 mm. longum et latum, aureum. *Petala* lateralia (alae) per paria in phyllum amplum bilobum

2·5–3 cm. longum et latum breviter stipitatum connata; lobus basalis minutus, varius, uncinatus, dilatatus vel deficiens; lobus distalis late dolabriformis vel semilunaris, apice acutus, pallide purpureus, basi stipiteque aureus; auricula dorsalis o; petalum anticum (labellum) lanceolatum, acuminatum, cymbiforme, 11 mm. longum, strictum, horizontale, lateribus involutis; calcar gracillimum, 3 cm. longum. *Filamenta* brevia, linearia; antherae didymae, obtusae, aureae. *Ovarium* ellipsoideo-oblongum, rectum, stigmatibus recurvis.

Burma. Henzada: S. Mayanaung Reserve; Kyibin Chaung, *C. W. Allan* (ex Hb. *Lace*).

This description, together with a drawing, was placed in the Herbarium by Sir Joseph Hooker in 1911 with a view to having it published in the Icones Plantarum. It is accompanied by the following note: "The remarkable species here figured was sent to me for the Kew Herbarium by my excellent correspondent, J. H. Lace, Esq., Chief of the Burmese Forest Dept. . . . I know of no species resembling it, and in the absence of fruit and seed it is impossible to determine its position in the Epitome of Burmese Balsams published in the Records of the Botanical Survey of India." The drawing will be incorporated in one of the next parts of the Icones Plantarum; but as it is desirable to have such a distinct species put on record, it is thought better not to delay the publication of the description any longer. The only material alteration made in Sir Joseph's original text concerns the use of certain terms for parts of the flower. This was deemed advisable in order to bring the description into line with the current conception of the Impatiens flower. At the same time, his terms have been retained in brackets, which will enable the student to correlate his terminology with that now accepted.

806. **Crataegus Lindenii,** *Stapf* [Rosaceae-Pomeae]; affinis *C. Rosei*, Eggl., sed foliis majoribus multo longius petiolatis supra magis pilosis haud glaucescentibus, inflorescentiis laxis, sepalis triangularibus brevioribus diversa.

Frutex vel arbor, inermis, ramis vetustis cortice cinereo tectis, hornotinis magis minusve laxe pilosis vel vegetis subglabris cortice castaneo. *Foliorum* lamina obovata, acuta, rarius apice rotundata, basi cuneata, interdum longe in petiolo decurrens, fere a basi argute inaequaliter dentata, incisuris hincinde profundioribus lobulos indicantibus, 2·5–6 cm. longa, 2–3 cm. lata, vix subcoriacea, supra laxe pilosa, infra ad costam villosula, ceterum ad nervos parcissime pilosa, siccando fuscescens, nervis utrinque 5 obliquis; petioli 5–10, vel in ramulis vegetis ad 2 cm., longi, laxe pilosi; stipulae haud visae, citissime caducae. *Corymbi* ad apices ramulorum foliigerorum 1·5–2·5 cm. longorum laxi, ad 2 cm. longi, ad 3 cm. diametro, pilis albis longiusculis laxe villosuli, pedunculo brevi vel nullo; bracteae subulatae, ad 3 mm. longae, tenues, parce glandulosae; pedicelli graciles, brevissimi vel ad 1 cm. longi. *Receptaculum* sub anthesi turbinato-campanulatum, 2·5 mm. altum, laxe villosulum. *Sepala* triangularia, acuta vel acuminata, ad 2 mm. longa, integra, raro hincinde denticulo addito, utrinque pilosula. *Petala* alba vel

rosea, rotundata, ad 5 mm. longa. *Stamina* circiter 10. *Styli* 5. *Fructus* ignotus.

Mexico. Chiapas; Ciudad Real (San Christoval), *Linden* 708.

807. **Begonia (Mitscherlichia) Rajah,** *Ridley* [Begoniaceae]; Gard. Chron. 1894, vol. xvi. p. 213, fig. 31 (nomen); Kew Bulletin, 1895, Appendix ii. p. 34 (nomen); a *B. goëgoensi*, N. E. Br., petiolis teretibus et hirsutis, foliis inaequaliter cordatis ciliatis subtus pilosis et insigniter purpureo-maculatis differt.

Herba acaulescens, nana. *Folia* radicalia, longe petiolata; limbus oblique cordato-orbicularis, breviter et abrupte acuminatus, crenulatus, interdum subangulatus, reticulato-venosus, 7–15 cm. longus, 6–15 cm. latus, viridis, insigniter brunneo-maculatus, supra nitidulus, bullatus, subtus pallidior, margine ciliatus; petioli suberecti, 8–25 cm. longi, pilosi; stipulae lanceolato-oblongae, subacutae, 1·5–2 cm. longae. *Pedunculi* suberecti, 20–25 cm. longi, pilosi, apice laxe cymosi. *Bracteae* ovatae, subacutae, 5–8 mm. longae, ut rachis roseo-suffusae. *Flores masculi* pedicellati, pedicellis gracilibus circiter 1 cm. longis. *Perianthii* segmenta 4, pallide rosea, 2 externa late obovato-orbicularia, obtusa, 1–1·2 cm. longa, 2 interiora anguste oblonga, obtusa. *Stamina* in toro convexo 1·5 mm. alto insidentia; filamenta brevissima; antherae obovato-oblongae, brevissimae. *Flores foeminei* graciliter pedicellati. *Perianthii* segmenta 3 vel 4, pallide rosea, quorum 2 exteriora late elliptico-ovata, obtusa, 6–7 mm. longa, caetera anguste oblonga et multo angustiora. *Ovarium* 3-loculare, 7–8 mm. longum, albidulum, roseo-marginatum, alis 4–5 mm. latis obtusis subaequalibus, placentis integris. *Styli* 3, basi breviter connati, 2–2·5 mm. longi, bifurcati, ramis in helicem sesquicyclicum tortis papillosis.

Malay Peninsula. Tringganu district.

This striking Begonia is a native of the Malay Peninsula, and was brought from the Tringganu district by a plant collector of the Singapore Botanic Gardens, where it flowered in 1892. It is mentioned in the Annual Report of the Singapore Botanic Garden for 1892 (page 3), as a very fine Begonia from Tringganu, but was not described. Plants were sent to Europe, and in August, 1894, it was exhibited at a meeting of the Royal Horticultural Society by Messrs. F. Sander and Co., St. Albans, and received a First-class Certificate. The plant on which this description is based is grown on the rockwork in the Nepenthes house at Kew. R. A. R.

808. **Senecio Purdomii,** *Turrill* [Compositae-Senecionideae]; *S. nelumbifolio*, Bur. et Franch., affinis, sed capitulis paucioribus majoribus, involucri bracteis dense fulvo-puberulis differt.

Caulis erectus, teres, longitudinaliter sulcatus, dense fulvo-puberulus. *Folia* radicalia late orbicularia, apice rotundata, basi valde cordata, 3·3 dm. longa (petiolo excluso), 4·1 dm. lata, margine undulata et regulariter dentata, dentibus parvis, supra glabra subtus in nervis praecipue fulvo-puberula, palmatinervia, nervis principalibus 5–7 pagina inferiore valde prominentibus superiore leviter impressis, lateralibus reticulatis

subtus prominentibus supra inconspicuis vel leviter impressis, longe petiolata, petiolo 7 mm. diametro puberulo. *Inflorescentia* paniculata, ramis dense fulvo-puberulis majoribus longitudinaliter sulcatis. *Capitula* ambitu obconica, usque ad 1·7 cm. longa et 9 mm. diametro, eligulata, multiflora. *Involucri bracteae* uniseriatae, liberae, oblongo-lineares, apice acutae, 1·1 cm. longae, 3 mm. latae, margine membranaceae, extra fulvo-puberulae, intus glabrae. *Flores* omnes tubulosi, 1·5 cm. longi; pappus albus, 6 mm. longus, barbellatus; corollae tubus 8 mm. longus, parte inferiore 4 mm. longa cylindrica fere 1 mm. diametro, superiore gradatim ampliata, apice 2 mm. diametro; lobi 5, oblongo-lanceolati, 1·75 mm. longi, 0·5 mm. lati, acuti; filamenta gracilia, 4 mm. longa; stylus leviter exsertus, bifidus; achaenia immatura oblongo-cylindrica, 5 mm. alta, 1·5 mm. diametro.

North-West China. Exact locality unknown, *Purdom* 770. Cultivated and communicated by Messrs. J. Veitch and Sons.

809. **Gentiana quinquenervia,** *Turrill* [Gentianaceae-Swertieae]; *G. macrophyllae*, Pallas, affinis sed foliis brevioribus angustioribus, corolla longiore late infundibuliformi differt.

Herba erecta, glabra, caulibus teretibus. *Folia* elliptico-lanceolata, acuta vel leviter acuminata, superiora basi connata, inferiora in vaginam tubulosam connata, usque ad 12·5 cm. longa et 3·6 cm. lata, glabra, margine angustissime membranaceo, nervis lateralibus utrinque 2 paullo supra basem exorientibus pagina superiore cum costa leviter impressis inferiore subprominentibus, costa subtus prominente. *Flores* 4–11, in foliorum superiorum axillis aggregati, sessiles. *Calyx* lateraliter profunde fissus, apice subtruncatus, tridentatus, dentibus 2–3 mm. longis inclusis 1·2 cm. longus, glaber. *Corolla* late infundibuliformis, 2·4 cm. longa; tubus 2 cm. longus, basi 1·5 mm., fauce 8 mm. diametro, glaber, intus superne maculis purpureo-viridibus ornatus, inferne albo-viridis, extra pallide virescens; lobi 5, late ovato-triangulares, apice subacuti, 5 mm. longi, 5 mm. lati, glabri, intus coerulei, extra virides, glabri; plicae apice bifidae, 3 mm. longae, 2 mm. latae, coeruleae. *Stamina* 5, filamentis decurrentibus, parte libera 4 mm. longa, antheris 2 mm. longis. *Ovarium* sessile, 1·2 cm. altum, 2 mm. diametro, glabrum, pallide viride; stigmata duo, 2 mm. longa.

North-West China. Collected by *Purdom*, exact locality unknown. Cultivated and communicated by Messrs. J. Veitch and Sons.

810. **Plectranthus bifidocalyx,** *Dunn* [Labiatae-Ocimoideae]; *P. macrocalyci*, Dunn, affinis, sed calcaribus calyce longioribus et dentibus calycis acutis distinctus.

Herba praeter foliorum venas et calyces sparse et brevissime puberulos omnino glabra. *Folia* ovato-lanceolata, apice basique acuminata, ad 6 cm. longa, papyracea, breviter serrata, media superioraque subsessilia. *Paniculae* longae, angustae vel ramosae; cymae parvae, laxae, 1–1·5 cm. longae, contiguae, inferiores bracteis parvis suffultae. *Flores* 7–8 mm. longi; pedicelli

3–4 mm. longi, bracteolis minimis linearibus medio provisi. *Calyx* sub anthesi 2–3 mm., fructu 5–6 mm. longus, bilabiatus, labiis sacco corollae late extensis, superiore leviter trilobo fructu revoluto, inferiore altius bidentato fructu recto. *Corolla* coerulea; tubus cylindricus, 2 mm. latus, ima basi subito ad 1 mm. contractus, itaque saccatus; labia tubo bis breviora. *Stamina* inclusa.

China. Kiukiang; Lushan mountains, September 27th, 1891, *Bullock* 67.

811. **Scutellaria Wongkei,** *Dunn* [Labiatae-Stachydeae]; *S. scordifoliae*, Fisch., affinis, petiolis longis corollaeque tubo gracili distincta.

Herba erecta, ramosa, foliosa, 20 cm. alta, omnino praeter corollam dense puberula. *Folia* ovata vel ovato-lanceolata, 2–4 cm. longa, obtusa, basi truncata, chartacea; petioli $\frac{1}{4}$–$\frac{1}{3}$ laminae aequantes. *Racemi* in ramis brevibus terminales, 3–5 cm. longi, densiflori. *Flores* singuli, oppositi, 1·2–1·3 cm. longi; pedicelli 3 mm. longi; bracteae bracteolaeque minutae. *Calyx* 2 mm. longus. *Corolla* coerulea, anguste cylindrica, ima basi refracta, fauce expansa, bilabiata, 1·0–1·1 cm. longa, tubo 2–3 mm. lato; labium superius erectum, breviter galeatum, lateralibus lobis patentibus provisum; labium inferius late expansum lateribus deflexis. *Stamina* inclusa. *Nuculae* non visae.

China. Kwangtung: Sanning ("Shun-ling"); Sze-tse-shan, Aug. 1903, *Wong-ke* (Hongkong Herb. 899).

Sanning is on the sea coast south of Hongkong and Wongke was sent there by the writer, then Superintendent of the Botanical and Forestry Department in Hongkong, to make a botanical collection in 1903. He subsequently accompanied the Superintendent on numerous botanical explorations in the interior of China, and this species is named in acknowledgment of his valuable services as a collector on these occasions.

812. **Euphorbia sinensis,** *Jesson et Turrill* [Euphorbiaceae-Euphorbieae]; *E. pekinensi*, Rupr., affinis sed caulibus et foliis subtus tomentosis, bracteis longioribus facile distinguenda.

Caulis erectus, herbaceus, teres, tomentosus. *Folia* oblongo-linearia, apice acuta, basi abrupte angustata, usque ad 8·5 cm. longa et 1·1 cm. lata, margine integra, pagina superiore glabra, inferiore costa glabra exclusa tomentosa, costa utrinque prominente, nervis lateralibus supra subprominentibus subtus obscuris, sessilia. *Umbella* terminalis composita, 7 cm. diametro, radiis primariis 8 circiter 3 cm. longis; umbellae axillares 9–11, simplices, longe pedunculatae, pedunculis circiter 6 cm. longis; folia umbellarum terminalium foliis subsimilia sed minora et minus tomentosa; folia umbellarum secundarum et axillarium anguste ovata, apice acuta, base rotundata, 1·8 cm. longa, 9 mm. lata, utrinque glabra. *Involucrum* campanulatum, 3 mm. altum, 3 mm. diametro, glabrum; lobi 4–5, late semiorbiculares, apice rotundati, 1 mm. longi, 1·25 mm. lati, margine leviter crenulata, glabri, glandulis 4–5 latissime orbicularibus apice rotundatis integris glabris. *Ovarium* immaturum tuberculatum.

North-West China. Exact locality not known, *Purdom*. Described from a plant raised and communicated by Messrs. J. Veitch and Sons, July, 1914.

813. **Hippeastrum** (**Habranthus**) **Elwesii,** *C. H. Wright* [Amaryllidaceae-Amarylleae]; species *H. Ananucae*, Phil., affinis, perianthii segmentis luteis concoloribus, tubo intus sanguineo, staminibusque perianthio dimidio brevioribus differt.

Folia synanthia, linearia, acuminata, concava, 26 cm. longa, 5 mm. lata. *Pedunculus* cylindricus, 6 mm. diametro, biflorus; spathae 2, herbaceae, oblongae, concavae, acutae, 6 cm. longae, 8 mm. latae; pedicelli circiter 4 cm. longi, crassiusculi. *Perianthium* claro luteum, tubo intus sanguineo; tubus infundibuliformis, 1 cm. longus, basi 6 mm. diametro, squamis brevibus transversalibus supra filamentorum insertionem instructus; lobi subpatentes, elliptici, subacuti, 4 cm. longi, 1·8 cm. lati. *Stamina* perianthio dimidio breviora. *Ovarium* oblongum, 1·2 cm. longum, 7 mm. diametro, subcylindricum; stylus staminibus duplo longior; stigmatis rami breves.

Argentina. Described from a plant which flowered in September, 1903, and again in July, 1914, at Colesborne from bulbs introduced from Rio Limay, near Lake Nahuel-Huapi, Argentina, by Mr. H. J. Elwes.

The perianth-segments of this species are uniformly yellow, those of *H. Ananuca* are yellow with a red midrib.

814. **Eriocaulon Christopheri,** *Fyson* [Eriocaulaceae]; affinis *E. collino*, Hook. f., foliis rigidis crassis, corollae segmentis ♂ perlongis differt.

Caules caespitosi. *Folia* 2·5–3 cm. longa, circiter 9–nervia, supra canaliculata. *Vaginae* 2·5 cm. longae, ore bifido. *Scapi* pauci. *Capitula* 0·5–0·8 cm. diametro. *Involucri* bracteae exteriores brunneae, glabrae, interiores acuminatae, nigrae. *Receptaculum* villosum. *Bracteae* florales pilis crassis albis ciliatae. *Flores* ♂ : *Sepala* in spatham uno latere fissam connata, pilis albis robustis ciliata. *Corolla* tubulosa; tubus gracilis; lobi inaequales, perlongi, glandulis parvis et margine pilis albis longis instructi. *Antherae* nigrae. *Flores* ♀ : *Sepala* navicularia, nigra, in carina et margine parce pilosa. *Petala* oblanceolata, alba, pilis longis et glandulis parvis instructa.

South India. Nilgiris; Pykara, 2100 m., May, *Fyson* 2718.

A plant collected by Schmidt at Kaity mounted with others on a sheet marked "*E. trilobum*" in the cover of *E. collinum* in Herb. Kew is probably this species.

815. **Eriocaulon Geoffreyi,** *Fyson* [Eriocaulaceae]; species scapis solitariis, foliis rigidis saepe recurvatis distincta.

Folia linearia, acuta, saepe recurvata, 1·5–3 cm. longa, plana, circiter 9–nervia. *Vaginae* 1·6 cm. longae, ore bifido scarioso. *Scapi* solitarii, pergraciles, 5–12 cm. longi. *Capitula* alba, 0·6 cm. diametro. *Involucri* bracteae nigrae, glabrae. *Receptaculum* glabrum. *Bracteae* florales obovatae, cuspidatae, nigrae, superne dorso et margine albo-pilosae. *Flores* ♂ 3 mm. longi. *Sepala*

in spatham uno latere fissam connata. *Corolla* tubulosa; tubus gracilis, basin versus angustatus, superne ampliatus et cupularis; lobi subaequales, pilis crassis longis albis et glandulis magnis nigris instructi. *Antherae* nigrae. *Flores* ♀ : *Sepala* navicularia. *Petala* oblanceolata, fere ad basin pilis longis albis gracilibus instructa.

South India. Pulney Hills, on damp ground, 2300 m., *Fyson* 2085, 2165.

816. **Eriocaulon Mariae,** *Fyson* [Eriocaulaceae]; species habitu nana, foliis latis, perianthii segmentis ♀ partitis valde distincta.

Folia 1·5–2 cm. longa, 2–3 mm. lata, prominenter costata, glabra. *Vaginae* 1·5 cm. longae, acutissimae, apice leviter ampliatae. *Scapi* 5–8, 2·5–4 cm. longi, graciles. *Capitula* 3–4 mm. diametro. *Involucri* bracteae pallide brunneae, glabrae. *Bracteae* florales acutae, nigrae, pilis albis caespitosis instructae. *Receptaculum* longe et dense villosum. *Sepala* in spatham uno latere fissam connata. *Corolla* tubulosa; tubus et lobi parvi, glandulis magnis instructi. *Flores* ♀ 1·5 mm. longi. *Sepala* et *petala* fere ad basin in pilis gracilibus partita.

South India. Pulney Hills, in marsh above Kodaikanal, 2300 m., *Fyson* 2086.

817. **Eriocaulon mysorense,** *Fyson* [Eriocaulaceae]; affinis *E. Wightiano*, Mart., sed involucri bracteis glabris, bracteis floralibus nigris differt.

Rhizoma breve. *Folia* caespitosa, linearia, 10–20 cm. longa, 0·5—1 cm. lata, multinervia, tenuiter pilosa. *Vaginae* foliis paulo breviores, acutae, multicostatae, parce pilosae. *Scapi* 9–10, usque ad 45 cm. longi, prominenter costati, pilosi, apice subvillosi. *Capitula* nivea, circiter 1 cm. diametro. *Involucri* bracteae flavescentes, lanato-pubescentes. *Receptaculum* villosum. *Bracteae* florales acutae, superiores acuminatae, albo-pubescentes, perianthium superantes. *Flores* ♂ pallide brunnei. *Sepala* in spatham connata, dorso parce pilosa. *Petala* brevia, conspicue unguiculata. *Antherae* nigrae. *Flores* ♀ : *Sepala* oblanceolato-oblonga, plana, superne dorso pilis albis instructa. *Petala* libera, apice pubescentia, intra nigro-glandulosa.—*E. Wightianum*, Mart. in Wall. Pl. As. Rar. iii. 28, partim.

South India. Mysore, 1000 m., *Fyson* 1654; *Wall. Cat.* 6067 B "*E.? sexangulare*, Heyne;" Kurg, *Hooker and Thomson*, Madras Coll. 51; Concan, *Hooker and Thomson*.

818. **Eriocaulon Oliveri,** *Fyson* [Eriocaulaceae]; affinis *E. Geoffreyi*, Fyson, sed majus, involucri bracteis albis, perianthii segmentis masculis haud nigris differt.

Folia 1·5–2·5 cm. longa, acuta, 9-nervia, glabra. *Vaginae* 2–2·5 cm. longae, ore ampliato bifido. *Scapi* solitarii, pergraciles, 10–15 cm. longi. *Capitula* alba, 0·5–0·6 cm. diametro. *Involucri* bracteae albae. *Receptaculum* parce villosum. *Bracteae* florales pilis numerosis crassis albis instructi. *Flores* ♂ 2·5–3 mm. longi. *Sepala* in spatham connata, inferne pallida, superne fusca,

dorso pilis albis pilosa. *Corolla* tubulosa; tubus basin versus angustatus; lobi inaequales, pilis longis et glandulis magnis instructi. *Antherae* nigrae. *Flores* ♀ : *Sepala* nigra. *Petala* superne pilis crassis albis paucis, inferne pilis albis longis gracilibus instructa.

South India. Pulney Hills, 2300 m., *Fyson* 2994.

819. **Aneilema pulneyensis,** *Fyson* [Commelinaceae-Commelineae]; affinis *A. esculento*, Wall., sed radicibus longioribus non succulentis, floribus majoribus, petalis obtusioribus differt.

Radices elongatae, non succulentae; caules caespitosi vel ramosi, 10–20 cm. longi, basin versus foliis instructi, glabri. *Foliorum* vaginae 1 cm. longae; laminae 4·5–5·5 cm. longae, 0·6 cm. latae. *Flores* laxe paniculati, 0·6 cm. longi; bracteae persistentes, ovatae, 3 mm. longae. *Sepala* elliptica, 3–nervia. *Petala* obovata, unguiculata, basi connata. *Staminodia* alte trilobata. *Filamenta* barbata. *Ovarium* 3–loculare, ovulis in loculis uniseriatis. *Capsula* oblongo-obovoidea, 4–5 mm. longa. *Semina* in quoque loculo 5–6.

South India. Pulney Hills, 2300 m., *Fyson* 435; *Bourne* 144; *Wall. Cat.* 5208 C., "Herb Heyne."

This species is allied to *A. esculentum*, Wall., but may be separated from it by the differences noted above. In addition it may be mentioned that whilst the new species grows in the temperate region at 7000 feet and more, *A. esculentum* is found in the tropical climate of the South Indian plains.

820. **Agathis flavescens,** *Ridley* [Coniferae-Araucarieae]; species *A. regiae*, Warb., affinis, foliis obtusis haud lanceolatis acutis, squamis strobili angustioribus et ad basin trilobis, lobis incurvis acutis, amentis masculis quam iis ullius speciei minoribus, iis *A. regiae* exceptis distincta.

Arbor 40-pedalis vel minor, ramis patulis flavescentibus. *Folia* elliptica, basi angustata, obtusa, valde coriacea, flavescentia, 5·5·7 cm. longa, 1·3–2·5 cm. lata. *Amenta* mascula 3·6 cm. longa, 1·3 cm. crassa, cylindrica, obtusa, squamis antheriferis 3 mm. longis apice 4 mm latis, limbo fere orbiculari, loculis paucis. *Strobilus* globosus, apice obtusus, 5·5 cm. longus, 4·5 cm. crassus. *Squamae* 3·1 cm. longae, 2·5 mm. latae, late obovatae, basi trilobae, lobis incurvis acutis, lobo mediano oblongo, limbo angusto vix 6 mm. lato. *Semen* ellipticum, utrinque rotundatum, complanatum, 1·2 cm. longum, 0·6 mm. latum, ala magna lata apice rotundata 1·2 cm. longa.

Malay Peninsula. Pahang; on the Padang of Gunong Tahan, 1530 m., *Ridley*.

This is a small species for the genus, only attaining a height of 40 feet with a diameter of trunk of 1 foot at the base on the open rocky plain at the top of Gunong Tahan. In the shadier woods it attains a greater height and here the leaves take on a green colour; on the exposed plain the whole plant is a curious yellow colour. It is quite distinct from *A. loranthifolia*, Salisb. (A. rhomboidalis, *Warb.*), the only other species in the Malay Peninsula, in its very small male spikes which are only comparable to those of *A. regia*, Warb., of Batchian.

LXI.—A NEW OIL-SEED FROM SOUTH AMERICA.

(Osteophloeum platyspermum, Warb.)

ENID M. JESSON.

At the present time, when vegetable fats are so largely in demand, the discovery of a seed yielding over fifty per cent. of fat, is likely to be of considerable commercial importance. The seed in question is that of *Osteophloeum platyspermum*, Warb. (Myristica platyspérma, *Spruce*), a shipment of which was recently received at Liverpool; the tree is a native of North-West Brazil, where it was discovered by Spruce in 1852, in the forest near Panuré, on the river Uaupés, a tributary of the river Negro.

Several members of the *Myristicaceae* are already well known as yielding hard, usually yellowish fats, containing a large proportion of the glyceride of myristic acid, and the present representative is no exception to the rule—the fat obtained on extraction with petroleum ether being white and crystalline, and possessing a very slight smell. 55·2 per cent. of fat was obtained from the kernels of this sample, the analytical constants of which are given below:—

Melting point	43° C.
Solidifying point	39° C.
Saponification value	240·2 mmg.
Iodine value (Wijs)	6·3 per cent.
Refractive index at 40° C. (Zeiss Butyro-refractometer)	36·9

In addition to the above, the oil was found to possess 5·3 per cent. of free fatty acids (calculated as oleic acid).

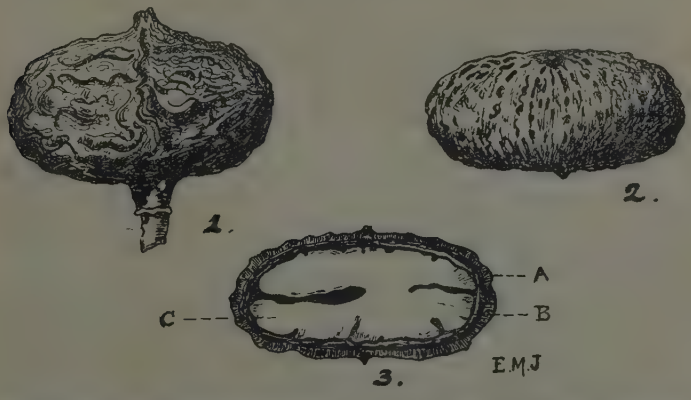


Fig. 1. Whole fruit showing pericarp. Fig. 2. Seed showing middle layer of testa. Fig. 3. Vertical section of seed, outer layer of testa removed. (A). Middle layer. (B). Inner layer. (C). Endosperm. All figures × 1½.

The fruits are globose or elliptic, about 2½ cm. long and 1½ cm. high, and are either solitary or borne in small clusters on a short pedicel, the dehiscence taking place in the median plane, into

two valves. They consist of a pericarp, which is about 1 mm. thick, and in the dry state dark brown and very much wrinkled (fig. 1). This encloses the seed, the testa of which is made up of three layers, the outer, yellowish and more or less scaly may still be seen on some of the seeds, but in the majority of cases it has disappeared. The second layer is brown like the pericarp, firm and rugose in a somewhat radial manner, as shown in fig. 2; finally there is a thin brown skin (which is often decomposed to a resinous mass) covering the greenish-white endosperm, and in section the characteristic ramifications of this innermost layer of the testa into the endosperm may be seen (fig. 3). It has been stated above that the fat is white, and this may be attributed to the fact that these ingrowths are few in number, and therefore do not discolour the fat brown or black on extraction, as in the case of *Scyphocephalium Ochocoa*, or dark yellow as in several other species of *Myristica*, though in all these cases the endosperm itself is white. The aril, usually present in members of this family, is stated by Warburg to be complete or entire and not laciniate, but as no trace of it can be found in the present seeds, it is probable that it disintegrates early.

The specimens received from Liverpool had already been decorticated, that is the outer shell (pericarp) had been removed, while the remaining inner shell (middle testa) was found to be present in the same proportion as the kernel. In this connection it is important to note that this inner shell, though firm, is brittle, and would present little or no difficulty in crushing and separating.

It is not possible to say at present the quantity in which these seeds may be available for commercial purposes.

LXII.—DIAGNOSES AFRICANAE: LXI.

1521. **Lonchocarpus brachybotrys,** *Dunn* [Leguminosae-Dalbergieae]; *L. eriocalyci*, Harms, affinis, sed florum paniculis cum foliis fasciculatis et foliolis minoribus distinctus.

Arbor mediocris (5–10 m.), ramis patentibus primo dense velutinis tandem glabris rugosis. *Folia* 3–4-juga, 5–10 cm. longa, petiolo 3–4-plo longiora, rachi breviter velutina; stipulae persistentes, lineares, 3–5 mm. longae, tomentosae; foliola superiora lateralia oblanceolata, acuta, apiculata, 3–4 cm. longa, subcoriacea, supra tandem glabra, nitentia, subtus tomentosa, venis margini appropinquantibus 6–7-paribus haud prominentibus; petioluli 1–2 mm. longi; stipellae setaceae, 2–3 mm. longae. *Flores* in racemis brevibus vel paniculis pauciramosis cum foliis lateraliter fasciculatis; bracteae bracteolaeque lineares, minutae. *Calyx* 5–6 mm. longus, dense breviter lanatus; dentes aequales, triangulares, obtusi, tubo paullo breviores. *Petala* non visa. *Stamina* diadelpha. *Legumen* lineari-oblongum, utrinque rotundatum vel basi cuneatum, ad 7 cm. longum, 2 cm. latum, molliter pubescens; valvae inter semina cohaerentes, papyraceae.

Tropical Africa. French Congo: Shari basin; Senoussi Country, banks of Boro River, *Chevalier* 7771; 7772.

1522. **Ostryoderris Chevalieri,** *Dunn* [Leguminosae-Dalbergieae]; *O. gabonicae,* Dunn, affinis, foliolis numerosioribus exstipellatis distincta.

Arbor 12–20 m. alta, parte basali 5–8 m. longa nuda, 15–35 cm. diametro, cortice brunneo rugoso, gummum rubrum exsudente. *Folia* (vix matura tantum visa) imparipinnata, 6–7-juga, 30–40 cm. longa, petiolo 3–4-plo longiora; stipellae breves, lanceolatae; foliola lateralia superiora oblongo-lanceolata, ad apicem obtusum breviter angustata, basi subcordata, obliqua, 6 cm. longa, papyracea, utrinque sparse puberula; venae margini appropinquantes 7–8; petioluli 5 mm. longi; stipellae o. *Flores* in racemos praecoces 12–20 cm. longos vel rarius in paniculas pauciramosas infra folia enatas dispositi; rachis ut pedicelli, calyces, bracteae bracteolae foliaque juvenilia pube densa grisea vestita. *Flores* singuli, 1·5 cm. longi; pedicelli 5 mm. longi; bracteae bracteolaeque lanceolatae, persistentes. *Calyx* late campanulatus, dentibus brevibus late ovatis. *Petala* alba, siccitate nigrescentia, glabra; vexilli lamina suborbiculata, arcte reflexa, convexa, vix emarginata, basi rotundata, exappendiculata, ungui brevi lato; alae falcato-oblongae; carina alis aequilonga at latior, petalis navicularibus dorso apice carinatis basi breviter auriculatis. *Stamina* diadelpha, vexillare solutum. *Ovarium* subsessile, lineare, villosum, ovulis 6. *Legumen* 2-alatum, immaturum 10–12 cm. longum, 2 cm. latum, sparse sericeum, utrinque ala 3 mm. lata marginatum.

Tropical Africa. Senegal: Bundu; Loridji and Kontia abundant across the savannahs at the sources of the right affluents of the Gambia, *Chevalier* 26,047; Senegal, *Heudelot* 347. French Guinea; Siguiri, *Chevalier* 298. Sierra Leone; Falaba, *Scott Elliot* 5225.

This species has long been represented in a fragmentary form in the Kew herbarium, and the specimens which allowed a description to be drawn up were recently communicated by M. Chevalier. The following interesting field note accompanied the specimens: "Petit arbre de 12 m. á 20 m. de haut; tronc de 5 m. à 8 m. sans branches et de 15 cm. á 35 cm. de diamétre. Ecorce brune s'enlevant en plaquettes epaisses. Les feuilles tombent à la fin de la floraison. Fleurs blanches, se detáchant facilement et jonchant le sol en quantité au moment de la floraison. Nom. vern. Dianbalaka (Kassonkés du Sénégal). Intérieur du Sénégal: croit en assez grande abondance à travers les savanes incendiées annuellement de la province du Niani-Ouli et dans le sud du Bondou."

1523. **Euryops Dieterlenii,** *J. Medley Wood* [Compositae-Senecionideae]; species habitu alto, foliis latis, capitulis longe pedunculatis solitariis distincta.

Frutex ramosus, usque ad 2·5 m. altus, flores flavos conspicuos gerens; rami teretes, petiolorum delapsorum cicatricibus et basibus dense induti. *Folia* sessilia, alternata, ad ramulorum apices aggregata, anguste oblonga, utrinque attenuata, apice tridentata, 5–9 cm. longa, medio 1·2–2 cm. lata, margine integra, dentibus 2·5 mm. longis. *Capitula* multiflora, radiata; pedunculi foliis

longiores, apice incrassati. *Involucri* bracteae circiter 12, 2-seriatae, acutae, ad medium connatae, inferne cupulares. *Receptaculum* conicum, alte alveolatum. *Corolla* florum disci basi cylindrica, superne campanulata, 5-fida, dentibus acutis. *Stylus* bifidus, ramis brevibus crassis apice minute puberulis. *Achaenia* oblonga, 8-costata, glabra. *Pappi* setae numerosae, caducae.

South Africa. Natal: Amawahqua Mountain; near Bulwer, 1850-2150 m., April, *Haygarth in Herb. Wood* 12,601; Basutoland, *Dieterlen* 465.

Only one species of *Euryops* has been figured in my "Natal Plants," viz. *E. pedunculatus*, N.E. Br. (vol. iv. t. 363), a very different plant from the one here described. *E. Dieterlenii* is a much-branched undershrub which forms a rounded bush 4–6 feet in height. Specimens were first sent to the Natal Herbarium by Mrs. Dieterlen, who was then living at Leribé, Basutoland, and after whom the plant is named. Mrs. Dieterlen has collected extensively in Basutoland and has enriched the Natal Herbarium by the donation of some hundreds of duplicates. The same species was subsequently found by Mr. W. J. Haygarth, in moist and nearly inaccessible places on almost or quite perpendicular rocks on the sides of Amawahqua Mountain, near Bulwer, Natal. Only a few plants were found on the edge of the precipice and within reach of the collector. *E. Dieterlenii* is a taller plant with much broader leaves than any other species of the genus known to us.—J. M. W.

1524. **Anagallis bella,** *Scott* [Primulaceae-Lysimachieae]; ab *A. ruandensi*, Knuth et Mildbr., foliis oblanceolatis haud oppositis, corollae laciniis longioribus distincta.

Caulis gracilis, solo adpressus, nodis radicans, radicibus 2–7 cm. longis, viridis, usque ad 10 cm. longus, 1 mm. crassus, valde striatus, glaberrimus, internodiis brevissimis. *Folia* semper alterna, numerosa, plus minusve conferta, erecta, integra, oblanceolata, basi valde attenuata, apice subacuta vel obtusa, 1–1·2 cm. longa, 2 mm. lata, glaberrima, pagina utraque olivaceo-viridia, nervis obscuris, subsessilia vel petiolo usque ad 1 mm. longo suffulta. *Flores* axillares, magni, pedicellis sub anthesi 5–8 mm. longis erectis suffulta. *Calyx* fere ad basin divisus, glaber; segmenta lanceolata, 3 mm. longa, viridia, margine albido-viridia, persistentia. *Corolla* sicco pallide rosea, 1·5 cm. diametro, fere ad basin partita, tubo 1 mm. longo, lobis integris oblongis vel oblongo-spatulatis 8–9 mm. longis plus minusve patentibus. *Stamina* basi in tubum 1 mm. altum coalita, filamentis gracillimis glaberrimis 3 mm. longis, antheris parvis ellipsoideis vix 1 mm. longis. *Stylus* gracillimus, 4–5 mm. longus, stigmate parvo haud distincto. *Pyxidium* glabrum, globosum, stylo persistente coronatum, 4 mm. diametro, calyce cinctum, solo pedicello recurvato sepultum.

Tropical Africa. British East Africa; Aberdare Mountains, 3000 m., *Battiscombe* 833.

1525. **Phyllanthus Woodii,** *Hutchinson* [Euphorbiaceae-

Phyllantheae]; affinis *P. Dekindtii*, Hutchinson, sed habitu fruticoso pedicellis brevioribus, floribus ♀ paucis differt.

Caules suberecti, sublignosi, glabri; ramuli laterales floriferi numerosi, solitarii vel 2–3–nati, graciles, patuli, dense foliati, glabri. *Folia* ovato-elliptica vel oblongo-lanceolata, utrinque rotundata, 3–10 mm. longa, 2–4 mm. lata, glabra, infra glauca, nervis lateralibus 3–4 subconspicuis; petioli vix 0·5 mm. longi, glabri; stipulae subulatae vel subulato-filiformes, acutae, circiter 1 mm. longae, glabrae. *Flores* monoici, in ramulo quoque plerumque masculi, interdum paucis (1–2) feminei additis. *Flores* ♂ : pedicelli 1·5 mm. longi, glabri; sepala 5, late obovata, apice rotundata, 1·5 mm. longa, 1·25 mm. lata, membranacea, glabra; disci glandulae 5, rotundatae, planae, crasse verrucosae; stamina 3; filamenta ad apicem connata; antherae lateraliter dehiscentes. *Flores* ♀ : sepala 5, oblonga vel oblongo-elliptica, apice rotundata, circiter 1·5 mm. longa et 1 mm. lata, membranacea, glabra; discus leviter lobatus (fere annularis), planus, rubescens, glaber; ovarium laeve; styli 3, e basi divergentes, graciles, bilobati, apice non incrassati. *Capsula* depresso-globosa, leviter 6–lobata. *Semina* fere laevia.—*P. Niruri*, Drège, Zwei Pflanzengeogr. Docum. 151, non Linn.

South Africa. Natal; damp places near the Tugela River, *Gerrard and Macken* 1925; Clairmont, *Wood* 1765; near Pinetown, *Wood* 5303; Alexandra district; Farm Friedenau, *Rudatis* 317. Pondoland; Egossa, *Sim* 2515; Mengana Cutting, between Umtata and Port St. John's, *Bolus* 10,279; between St. John's River and Amsikaba River, *Drège* a; between Umtentu River and Umzimkulu River, *Drège* b.

1526. **Croton penduliflorus,** *Hutchinson* [Euphorbiaceae-Crotoneae]; affinis *C. Lehmbachii*, Hutchinson, sed foliis breviter acuminatis basi penninerviis, glandulis basalibus longe stipitatis, racemis longioribus floribus ♂ et ♀ intermixtis differt.

Ramuli leviter angulati, parce breviter puberuli vel glabri. *Folia* obovata vel obovato-elliptica, apice breviter acuminata, obtusa, basi subcuneata, 9–12 cm. longa, 5–6·5 cm. lata, crenato-dentata, membranacea, utrinque parce stellato-puberula, nervis lateralibus utrinque 5–7 arcuatis utrinque conspicuis, venis laxe anastomosantibus; glandulae basales annulares, stipitatae, stipite 2 mm. longo; petioli 3–4 cm. longi, subteretes, fere glabri. *Inflorescentia* bisexualis, terminalis, pendula, gracilis, usque ad 40 cm. longa, floribus ♂ numerosis femineis paucibus intermixtis; rachis prominenter sulcata, stellato-puberula; pedicelli graciles, ad 4 mm. longi, breviter pubescentes. *Flores* ♂ : sepala ovata, obtusa, 1·5 mm. longa, 1·25 mm. lata, parce stellato-pubescentia; petala obovata, apice rotundata, 2 mm. longa, 1 mm. lata, margine intra dense villosa, extra glabra; stamina circiter 12; filamenta filiformia; antherae 0·75 mm. longae; receptaculum albo-villosum. *Flores* ♀ : sepala oblongo-lanceolata, subacuta, 2 mm. longa, extra et apice pubescentia; petala nulla; ovarium tomentellum; styli basi liberi, bipartiti, recurvati.

Tropical Africa. Sierra Leone; Kennema, on the road to the station, May, *Aylmer* 138.

1527. **Antholyza speciosa,** *C. H. Wright* [Iridaceae-Ixieae]; *A. watsonioidi,* Baker, affinis, perianthii lobis ellipticis obtusis differt.

Cormus subglobosus, tunicis membranaceis reticulatis vestitus. *Caulis* erectus, validus. *Folia* ensiformia, acuminata, 9 dm. longa, 2–2·3 cm. lata; nervus centralis crassus. *Spica* ramosa, circa 1·5 m. alta; spathae herbaceae, virides, purpureo-tinctae, late lanceolatae, 6 cm. longae, 1·5 cm. latae. *Perianthium* roseum; tubus curvatus, 3 cm. longus, parte superiore 7 mm. diametro; lobi subaequales, elliptici, obtusi, 3 cm. longi, 1·5 cm. lati. *Stamina* perianthio breviora; antherae 1 cm. longae, obtusae, basi sagittatae. *Ovarium* oblongum, trilobatum; stylus filiformis, rami oblanceolati.

British East Africa. Aberdare Mountains, 3050 m. *Battiscombe* 838.

1528. **Dracaena sessiliflora,** *C. H. Wright* [Liliaceae-Dracaeneae]; species *D. surculosae,* Lindl., affinis, inflorescentia sessili floribusque haud pedicellatis differt.

Caulis teres, levis, annulatus. *Folia* subopposita, elliptica, utrinque attenuata, breviter petiolata, glabra, 15 cm. longa, 4 cm. lata. *Capitulum* terminale, multiflorum; bracteae ellipticae, obtusae, 7 mm. longae. *Calycis* tubus 2·6 cm. longus, gracilis, rectus; lobi oblongi, obtusi, 7 mm. longi, 2 mm. lati. *Stamina* exserta; filamenta 5 mm. longa; antherae oblongae, obtusae, 2·5 mm. longae. *Ovarium* ovoideum, obscure trisulcatum; stylus filiformis, staminibus, aequilongus; stigma punctiforme.

Tropical Africa. Sierra Leone; Heddle's Farm, common in undergrowth, *C. E. Lane-Poole* 155.

This species resembles *D. surculosa,* Lindl., which differs in having a lax inflorescence with slender peduncle and pedicels. The leaves appear to be whorled through the approximation of two decussate pairs.

1529. **Juncellus altus,** *Turrill* [Cyperaceae-Scirpoideae]; *J. pustulato,* C. B. Clarke, affinis, sed glumis longioribus angustioribus, nucibus biconvexis minoribus angustioribus distinguendus.

Culmi erecti, usque ad 9 dm. alti, inferne teretes vel subteretes, superne inconspicue trigoni, glabri, laeves, basi vaginis membranaceis glabris 8 mm. latis obtecti. *Folia* setacea, apice subacuta, usque ad 4·5 dm. longa et 1 mm. diametro, sulcata, glabra, laevia. *Inflorescentia* terminalis, radiis 2–5 usque ad 8 cm. longis vel spicis interdum fere sessilibus; bracteae 2–3, foliis similes, usque ad 2·2 dm. longae. *Spiculae* 4–9 aggregatae, ambitu elliptico-lanceolatae, 0·5–1·2 cm. longae, 3·5 mm. latae, multiflorae; rhachis compressa, 1 mm. lata, glabra. *Glumae* oblongo-ovatae, subobtusae, 3 mm. longae, 1·75 mm. latae, longitudinaliter nervosae, castaneo-brunneae, glabrae. *Stamina* 3, filamentis 3 mm. longis, antheris linearibus 1·75 mm. longis. *Ovarium* biconvexe ellipsoideum, 0·75 mm. altum, 0·4 mm. diametro, glabrum; stylus cum ramis duobus 0·75 mm. longis 2·2 mm. longus, glaber. *Nux* subaequaliter biconvexe ellipsoidea, 1·5 mm. alta, 1 mm. diametro, glabra, laevis, canescens.

Tropical Africa. Angola: Benguella; country of the Ganguellas and the Ambuellas, *Gossweiler*.

1530. **Pycreus pubescens,** *Turrill* [Cyperaceae-Scirpoideae]; *P. angulato*, Nees, affinis, sed culmis foliisque pubescentibus, nucibus minoribus truncatis differt.

Rhizoma breve, horizontale. *Culmi* erecti, usque ad 8·5 dm. alti, triangulares, sulcati, pubescentes, basi foliorum vaginis haud vel leviter fibrosis obtecti. *Folia* linearia, acuta, usque ad 3 dm. longa et 3 mm. lata, pagina superiore pubescentia, inferiore dense pubescentia. *Inflorescentia* composita, radiis circiter 4–5 usque ad 10·5 cm. longis 2–8-spiculatis; bracteae 2–3, foliis similes, inter se inaequales, usque ad 16 cm. longae. *Spiculae* ambitu elliptico-lanceolatae, multiflorae, 1–2 cm. longae, 3·5–6 mm. latae. *Glumae* anguste ovato-oblongae, acutae, circiter 5 mm. longae et 2·5 mm. latae, stramineae vel pallide brunneae, glabrae, laeves, deciduae. *Stamina* 2, filamentis usque ad 5 mm. longis, antheris anguste linearibus 2·2 mm. longis. *Ovarium* biconvexe obovoideum, lateraliter compressum, 1 mm. altum, 0·75 mm. diametro; stylus integer vel juventute cum ramis duobus 2·5 mm. longis 3·5 mm. longus. *Nux* biconvexe obovata, lateraliter compressa, truncata, 1·25 mm. alta, 1 mm. diametro, nigra, styli basi haud dilatata persistente.

Tropical Africa. Angola: Benguella; country of the Ganguellas and Ambuellas, *Gossweiler* 3920.

This plant possesses several remarkable characters which make it a very distinct species of *Pycreus*. Similar hairy leaves and stems are very uncommon in those *Cyperaceae* which have distichous glumes. The nuts are remarkably persistent on the rhachis, and the style too is subpersistent, though it finally breaks off, leaving its base attached to the middle of the truncate apex of the nut as a short apiculus. The two style arms fuse when the flowering period is over, and so in ripening nuts there appears to be an entire style.

LXIII.—THE ECONOMIC PROPERTIES OF SOME HARDY ORNAMENTAL FRUITS.

W. Dallimore.

During the present autumn numerous enquiries have been addressed to Kew regarding the domestic value of different kinds of ornamental fruits. The following notes have therefore been prepared in order to direct attention to some of the uses to which such fruits have been or are at present applied. It is doubtful, however, whether the thrifty housewife will consider the majority of those which are wholesome worth the trouble and expense which is necessary to make them palatable, for, when they are sufficiently plentiful to warrant the trouble of gathering, cultivated fruits of far superior quality are also usually abundant. Moreover, it is doubtful whether many of these fruits would survive the trial stage, for although our forefathers may have appreciated bletted service berries, mountain ash beer and candied barberies, modern taste prefers the more luscious fruits of the present day orchard.

Barbery.—The fruits of the common barbery (*Berberis vulgaris*, L.), are too acid to be eaten in the raw state, but they are sometimes made into jelly in the same way as red currants, the jelly being considered to possess a fine, pleasant, acid flavour. The fruits have also been candied and otherwise preserved with sugar and in an unripe condition they have been pickled in vinegar. Johnson and Sowerby "Useful Plants of Great Britain," refer to the fruits of the barbery being macerated in about 12 times their quantity of water, to which a little fennel seed has been added, and afterwards used as a cooling draught in cases of fever; whilst Bentley and Triman "Medicinal Plants," say that the ripe fruits are used in the preparation of cooling, astringent and antiscorbutic drinks which are given in febrile diseases and diarrhœa. It is probable that the fruits of all the species of *Berberis* can be used for similar purposes, for in North America those of *B. Aquifolium*, Pursh., are marketed for culinary purposes under the name of Oregon grapes; those of *B. aristata*, D C., and *B. Lycium*, Royle, are used in the Himalaya, and those of *B. asiatica*, Roxb., in the Himalaya and in China.

Spindle Tree.—The fruits of the spindle tree (*Euonymus europaeus*, L., are said to be poisonous and to have violent emetic and purgative properties, although the seeds are eaten by birds. A yellow dye has been obtained by boiling the seeds in water, and by mixing with alum a green dye may be procured. Johnson and Sowerby, l.c.

Holly.—*Ilex Aquifolium*, L., and other species of the genus produce fruits with violent purgative properties. They have practically no economic value but are eagerly eaten by birds during severe winters.

Buckthorn.—The juice of the ripe berries of the buckthorn of English hedgerows, *Rhamnus cathartica*, L., mixed with alum or lime furnishes the water-colour paint known as sap green, whilst dye is obtained from the fruits of *R. Frangula*, L., *R. infectoria*, L., and possibly from those of other kinds also. The fruits have violent purgative properties and must not be eaten.

Wild Cherry, Gean or Mazzard.—The wild cherry (*Prunus Avium*, L.), grows into a large tree and bears good crops of fruit in many parts of the country. The fruits are very acid and are usually overlooked by reason of the many kinds of cultivated cherries. They are, however, eagerly eaten by birds and have been employed in the manufacture of liqueurs. According to Loudon, "Arboretum et Fruticetum," Kirschwasser and Ratafia of Grenoble were prepared from the fruits about the middle of last century. Regarding the former he says: "The method of making the celebrated spirit is to take bruised cherries, in which the greater part of the kernels have also been broken, and to let them remain in a mass till the vinous fermentation is fairly established, after which the process of distillation is commenced and continued as long as the liquor comes over clear,

or till about a pint of liquor has been obtained from every 20 pints of fermented pulp. The kirschewasser comes from the still as clear as the purest water, and in order that it may not receive any tinge which would lessen its value, it is always kept in stone vessels or bottles." Alsace, Wurtemberg and Berne are given as the principal places of manufacture. The liqueur "Maraschino" was prepared from the fruit of *P. Marasca*, now included as a variety of *P. acida*, Borkh., in Dalmatia.

Bird Cherry.—The fruits of this tree, *Prunus Padus*, L., have a disagreeable flavour, but they are said to impart an agreeable flavour to brandy and home made wines, whilst in Sweden, Lapland, and some parts of Russia, a strong spirit has been prepared from the bruised and fermented fruit. According to Sargent, "Silva of N. America," the fruits of the American bird cherry (*P. virginiana*, L.), are used for a cordial by infusion in rum and brandy with sugar. The fruits of *P. serotina*, Ehrh., are used for a similar purpose.

Sloe or Blackthorn.—This plant (*Prunus spinosa*, L.), is common in English hedgerows and its black fruits are often produced in abundance. The fruits are too astringent to be pleasant, and although they are said to be eaten in some districts of the North of Europe, and with sugar to make a good preserve, they find little favour here. Their best known use is in the preparation of sloe gin; they have also been used for making a wine. The juice inspissated is said to form a nearly indelible ink.

Myrobalan or Cherry Plum (*Prunus cerasifera*, Ehrh.).—The fruits of this are used for preserves, puddings, pies and other culinary purposes. They have a pleasant acid taste and can also be used for dessert.

Peach (double-flowered).—The fruits of *Prunus Persica flore pleno* can be used for stewing or for preserving. For the latter purpose the stones should be removed. Some trees produce fruits with great regularity.

Common Laurel.—Birds are fond of the fruits of this bush (*Prunus Laurocerasus*, L.), but the flesh is too ill-flavoured for human food, moreover the plant contains prussic acid in its leaves and in the kernels of the fruits, therefore it is inadvisable to use the fruits for domestic purposes, although Loudon, l.c., refers to them as being sometimes used for puddings, and Miller, "Gardeners' Dictionary," says that the berries have been used for flavouring brandy and other spirits.

Almond (*Prunus Amygdalus*, Stokes.).—The greater number of almond trees found in gardens in the British Isles bear nuts with sweet kernels which are quite wholesome although they do not belong to the thin shelled variety *dulcis* which produces the dessert almonds of commerce. As an occasional tree may be found with bitter kernels, however, care should be taken in the use of the fruits, for the variety *amara*, with bitter kernels, contains

prussic acid and the consumption of a few kernels may result in serious consequences.

Crab Apple (*Pyrus Malus*, L.).—The fruits of the wild crab-apple are exceedingly sour and of little value, although Loudon, l.c., says that a drink called "boisson" was, in his day, made from them in France and England, and that a kind of vinegar known as "verjuice" was also made from them. The cultivated kinds of crab-apples, however, such as John Downie, Dartmouth and Transcendent, may all be used for jelly, whilst the Siberian crab, *P. baccata*, L., and the fruit of other exotic kinds can be used for the same purpose.

Mountain Ash or Rowan.—The red berries of this tree, *Pyrus Aucuparia*, Gaertn., are eagerly eaten by birds in spite of their extremely acid and rather bitter flavour. They have been used for jelly, but are not popular for the purpose. In Wales and in some European countries a strong spirit and a kind of beer have been made from them, whilst in some parts of the North of Europe the berries have been dried and ground into flour for bread making in times of scarcity. The fruits of the variety *rossica* are sweet and in the south of Russia they are preserved with sugar and sold as a sweetmeat. The berries of the variety *moravica* are larger and have a more pleasant taste than those of the type. They are used for culinary purposes in Moravia.

Service Tree.—The fruits of this tree, *Pyrus Sorbus*, Gaertn., were at one time used for dessert when in a condition approaching decay, as are medlars, but they have long since passed into disuse. Loudon refers to their use in Brittany in the manufacture of a very good cider or perry.

White Beam.—For almost all purposes the fruit of the white beam tree (*Pyrus Aria*, L.), can be used in a similar way to that of *P. Aucuparia*. It is, however, more pleasant to the taste and was at one time eaten when approaching a decayed condition. The fruit of the wild service (*P. Torminalis*, DC.), has been used for food when in a similar state.

Quince.—The fruit of the common quince, *Cydonia vulgaris*, Pers., is in frequent use as a flavouring agent and for making marmalade and jelly. The fruit of the two Japanese quinces, *C. japonica*, Thunb. and *C. Maulei*, T. Moore, are also used for jelly and other conserves. The fruit of *C. Maulei* has been specially recommended for the purpose.

Juneberry (*Amelanchier canadensis*) Medic. Although not in use in this country, the fruits of this tree are sometimes used for cakes and preserves in N. America.

Rose.—Fruits of various species of *Rosa* have been used for jellies and preserves, particularly large fruits like those borne by *R. rugosa*. The flesh is separated from the seeds and their attendant hairs, and preserved with sugar in the ordinary way. Rose jelly is considered to be a great delicacy in some countries.

Haws or Hawthorn Fruits.—The fruits of *Crataegus Oxyacantha*, L., are referred to by Johnson and Sowerby, l.c., as being seldom eaten here although very nutritious. They are said to be eaten largely in Kamtschatka and also to be made into a kind of wine by fermenting with water. The haws of several kinds of *Crataegus*, particularly those of *C. Azarolus*, L., and *C. tanacetifolia*, Pers., are apple-like in outline, nearly an inch in diameter and rather pleasant to the taste. They are sometimes used as dessert fruits.

Cotoneaster.—The fruits of most kinds of Cotoneaster are eagerly eaten by birds, but they do not appear to have been put to any domestic use.

Blackberries.—The fruits of various species of *Rubus* are known throughout the country as blackberries and they are the most useful of our wild fruits. The fruit of the wild raspberry, *R. Idaeus*, L., the cloudberry, *R. Chamaemorus*, L.; and stone bramble, *R. saxatilis*, L., are other British kinds which bear useful fruits. The fruits of many exotic kinds of *Rubus* may be used for similar purposes.

Elderberry.—*Sambucus nigra*, L., the common elder is a familiar shrub or small tree in most parts of the country. Its fruits are eagerly eaten by birds, but they are also gathered and made into a wine or syrup, which in a warm and sometimes spiced condition is frequently used in country places as a remedy for colds, in addition to being served as a beverage. The berries are said to have cooling, aperient, and diuretic properties, but to act as an emetic on some people. They have sometimes been used as a dye.

Guelder Rose (*Viburnum Opulus*, L.).—Loudon, l.c., refers to the fruit of this shrub being eaten in Sweden and also gives a reference to them being eaten in Siberia; elsewhere he says that they are bitter and nauseous. Neither the fruits of this species nor those of *V. Lantana*, L., have any use in this country, however, and are usually considered to be unwholesome though birds eat them greedily enough.

Honeysuckle or **Woodbine.**—The fruits of *Lonicera Periclymenum*, L., and other species have a disagreeable flavour and are credited with emetic properties, but they are usually eaten by birds as soon as they are ripe.

Tea Tree or **Box Thorn** (*Lycium chinense*, Mill.).—In this case the fruits are considered to be unwholesome, and to possess purgative properties. Other species are of no greater use.

Bitter Sweet (*Solanum Dulcamara*, L.)—The bright red berries of this trailing shrub have alternately a bitter and a sweet taste. They have poisonous properties and are of no value.

Strawberry Tree (*Arbutus Unedo*, L.).—The fruits of this plant do not appear to have been put to any regular use, though

Johnson and Sowerby, l.c., mention that they are collected and eaten by the peasantry in Ireland and L. H. Grindon in "Fruits and Fruit-trees," says that they are sometimes used in Spain and Corsica for the manufacture, by distillation, of a simple wine.

Bearberry (*Arctostaphylos Uva-ursi*, Spreng.).—This trailing shrub is found wild in the Highlands of Scotland and is common throughout the Northern Hemisphere. The berries do not appear to have been used for human food though they are eagerly eaten by grouse and other birds.

Bilberry, Blueberry, Whinberry, Hurtleberry, Whortleberry.—These names are applied to the fruit of a low-growing shrub, *Vaccinium Myrtillus*, L., widely distributed in the Northern Hemisphere and a native of the British Isles. The small blue-black berries are ripe in July and August and are used for pies, puddings, jams, jellies and other culinary purposes. They have also been used as a dye. The red fruits of another native species, *V. Vitis-idaea*, L., commonly called the cowberry, can be used in a similar manner and the fruits of exotic species are also edible.

Cranberries (*Oxycoccus macrocarpus*, Pers., and *O. palustris*, Pers.).—The first-named is a native of N. America and the other one is widely distributed through the Northern Hemisphere. The fruits of one or both species are sold by most fruiterers and are used for tarts and jelly.

Dogwood Berries.—Johnson and Sowerby, l.c., say that excellent oil adapted for domestic purposes, especially for burning in lamps, is obtained from the common dogwood, *Cornus sanguinea*, L., and Loudon, l.c., gives the yield of oil as 34 pounds of oil to 100 pounds of fruit. The latter also says that the fruits of the Cornel, *C. Mas*, L., were in his time used on the Continent for confectionery, marmalades, robs and liqueurs, also mixed with apples and pears for making cider; treated like green olives they formed a pickle and in a ripe state an oil was obtained from them. The fruits of *C. capitata*, Wall., are said to be eaten in the Himalaya, but they are not used in this country.

Sea Buckthorn (*Hippophae rhamnoides*, L.).—Although the berries of this shrub are very disagreeable to the taste they are referred to as follows by Johnson and Sowerby, l.c. "The Siberians and Tartars make a jelly from the berries, and eat them with milk and cheese, while the inhabitants of the shores of the Gulf of Bothnia prepare from them an agreeable rob, which they used as a condiment to their fish." An allied shrub, *Elaeagnus multiflora*, Thunb., bears orange-coloured fruits which are sometimes used for jam.

Bay (*Laurus nobilis*, L.).—Little use appears to have been made of the fruits of this tree although they were at one time considered to possess medicinal properties of astringent and carminative character.

Ivy.—The fruits of the ivy (*Hedera Helix*, L.), are said to possess purgative and emetic properties, but they are eagerly eaten by birds.

Mezereon.—The bright scarlet fruits of *Daphne Mezereum*, L., are of attractive appearance but are poisonous in character. A few berries have been known to result in the death of children who have inadvertently eaten them.

Privet.—From the fruits of *Ligustrum vulgare*, L., a rose-coloured dye has been obtained and according to Johnson and Sowerby, l.c., "they yield, when ripe, a good green dye to woollen cloth, previously dipped in a solution of alum, and the tint so imparted is more permanent than most vegetable greens."

Myrtilla (*Myrtus Ugni*, Hook. and Arn.).—The small sweet fruits of this shrub can be used for jam and jelly making. The fruit of the common myrtle (*Myrtus communis*, L.), has been used for similar purposes.

Yew.—Although nothing is to be gained by using the fruits of the yew (*Taxus baccata*, L.), the fleshy covering of the seed is not poisonous and is eagerly eaten by birds, and often by children.

Chile Pine or **Monkey Puzzle** (*Araucaria imbricata*, Pav.). The seeds of this tree are edible and are eaten regularly in Chile.

Stone Pine and **Swiss Stone Pine** (*Pinus Pinea*, L., and *P. Cembra*, L.). The kernels of the seeds of both these trees are used regularly for food by vegetarians and others in European countries.

LXIV.—MISCELLANEOUS NOTES.

Mr. J. C. Moore.—We learn that Mr. J. C. Moore, Agricultural Superintendent, St. Lucia (*K. B.*, 1895, p. 155), has been appointed Agricultural Superintendent, Grenada, in succession to Mr. G. G. Auchinleck, transferred to Mauritius (*K. B.*, 1914, p. 227).

Mr. S. C. Harland.—We learn that Mr. S. C. Harland, B.Sc., Assistant at the Agricultural Experiment Station, St. Croix, West Indies, has been appointed Assistant Agricultural Superintendent, St. Vincent, in succession to Mr. F. Birkinshaw, transferred to Mauritius (*K. B.*, 1914, p. 227).

Mr. A. B. Culham, a Curator in the Agricultural Department of the Southern Provinces of Nigeria (*K. B.*, 1910, p. 197), has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Senior Curator in the Agricultural Department of the Gold Coast.

Mr. G. C. Johnson.—Mr. G. C. Johnson, a member of the gardening staff of the Royal Botanic Gardens, has been appointed, on the recommendation of Kew, a Sub-Inspector for the purposes of the Destructive Insects and Pests Acts under the Board of Agriculture and Fisheries.

The Giant Orchid.—The large plant of *Grammatophyllum speciosum* presented to Kew by Messrs. Sander and Sons, Bruges and St. Albans, in May, 1893, and since then one of the principal features of House No. 10, is again flowering. Owing to its having been found necessary to reduce the plant last year by removing the oldest pseudo-bulbs, it has on this occasion only one flower-spike, about 7 ft. in height, and carrying over fifty flowers and buds. A better idea of the capabilities of this remarkable orchid was obtained when the Kew specimen flowered in 1907. It then developed three racemes; the tallest attained nearly 11 ft. in height, and had, at one time, 82 expanded flowers and 40 unopened buds in various stages of development, the other two racemes being only slightly smaller. The largest flowers are commonly 6 ins. in diameter, and are borne on the lower half of the inflorescence. The flowers have a spice-like odour and good lasting qualities. Their ground colour is dull yellow, heavily spotted with reddish brown; the sepals and petals are spreading, broadly oblong obtuse, undulate; the lip is small, being scarcely 1 in. long, three-lobed, orange streaked with red, the disk sulcate, with three raised plates, bristling with short hairs. The column is greenish-yellow spotted with reddish-brown. *G. speciosum* is the most common of the three or four species inhabiting the Malay Archipelago and Malacca. In a wild state, or cultivated in tropical gardens, it forms enormous masses on large trees, producing as many as fifty flower-spikes at one time. It was first flowered in this country in 1851. The Kew plant was one of the largest that could be found in the neighbourhood of Penang. It was originally intended for the Chicago Exposition, but, meeting with an accident during the voyage to England, it was decided not to send it any further.

W. W.

Botanical Magazine for November.—The plants figured are *Coelogyne brachyptera*, Reichb. f. (t. 8582); *Echinocactus minusculus*, Weber (t. 8583); *Nothofagus Cunninghamii*, Bl. (t. 8584); *Lonicera fragrantissima*, Lindl. et Paxt. (t. 8585); and *Primula vittata*, Bur. et Franch. (t. 8586).

The *Coelogyne* was described as long ago as 1881 by Reichenbach from material sent by Messrs. Hugh Low and Co., which had been imported from Burma, and considerable doubt was entertained as to its exact identity. The species was lost sight of from that time until the year 1910, when it was received with a small collection of orchids from Tenasserim, presented to Kew by Mr. H. Tilley, of Moulmein. It flowered at Kew in May, 1914. The flowers have a greenish-yellow lip with an

orange-coloured disc and show that *C. brachyptera* must be regarded as a distinct species from its nearest ally, *C. Parishii*, Hook, f.

Echinocactus minusculus, from Tucuman in Argentina, is one of the more interesting and easily cultivated of the small *Cactaceae*. It was introduced to cultivation about 1895. The flowers, as in *E. Fiebrigii*, Guerke, which are very numerous, are produced from the base instead of from the upper part of the plant, and this feature serves to distinguish these two species from others of the genus. The flowers have a crimson tube and vermilion petals and only remain open for a day or two.

The Southern "Beech" or "Myrtle Tree" of Tasmania is found on the mountains up to an altitude of 4000 ft., and is one of the main constituents of the evergreen forest. It is also found in south-eastern Australia. At Kew *Nothofagus Cunninghamii* is not hardy, but in the milder parts of the British Isles, notably, at Fota and at Osborne, there are fine specimens of this elegant tree. The tree at Fota is now nearly 50 ft. high and was probably planted half-a-century ago. Our illustration was taken from the small tree grown in the Temperate House at Kew, which is one of the plants presented to Kew by the late Mr. George Joad, of Wimbledon, in 1881. *N. Cunninghamii* is most nearly allied to *N. Menziesii*, Oerst., from New Zealand.

Lonicera fragrantissima has been in cultivation since 1845, when Fortune introduced it from Chinese gardens on behalf of the Royal Horticultural Society. In the wild state the plant is unknown. The well-known *L. Standishii*, Carr., is closely allied to our plant and the two species have sometimes been confused, the glabrous branches, elliptic or ovate-elliptic leaves, and externally glabrous corolla tube, distinguish *L. fragrantissima* from its ally.

The Chinese *Primula* was described from specimens collected in Szechuan, by Prince Henry of Orleans and Mr. Bonvalot, during their Chino-Tibetan journey. It is closely allied to *P. secundiflora*, Franchet, and like it has purple flowers, whereas the other members of the group, of which *P. sikkimensis*, Hook. f., is the best known, have yellow flowers. *P. vittata* can be distinguished from *P. secundiflora* by its erect, elongated leaves. We owe its first introduction to Mr. E. H. Wilson, who sent home seeds to Messrs. J. Veitch and Sons, in 1905, and subsequently, Mr. Forrest sent seeds to Messrs. Bees, Ltd. It was from one of the plants raised from Mr. Forrest's seeds that our plate has been prepared.

Bagolaro or Nettle Tree (*Celtis australis*, L.).—In the *Bulletin* for June, 1893, p. 145, appeared a brief reference to the application of the wood of this tree for making whip handles in the south of France, and in Bulletin No. 5, 1908, p. 230, is a further note on examples of rough and finished hay forks made on the Riviera from specially pollarded and trained trees of the same species. Specimens to illustrate both these industries are contained in

Case 109, Museum No. I. The tree is a native of the Mediterranean region, extending to Asia Minor and probably further eastwards in the Caucasus and Northern Persia. In France it is common in Provence and Languedoc, being cultivated as coppice. It has a straight trunk and branched head attaining 50 to 70 feet in height and a girth of 10 feet, but in rare cases becoming 20 feet in girth. The branches are long, slender and flexible, with a grey bark spotted with white and covered with a slight down at the extremities. The bark of the trunk is rich brown, in old trees covered with warty excrescences. The leaves are dark green, about 4 inches long and $1\frac{1}{4}$ inches broad, oval-lanceolate in shape, and are sometimes used for fodder. The flowers are of a greenish colour and inconspicuous. The fruit, which, when ripe, is blackish and resembles a very small withered wild cherry, is said not to become edible until the first frosts, and it hangs on until the following spring. It is remarkably sweet, and is considered by some writers to be the Lotus of the ancients. The berries are eaten in Spain and in Greece are known as Honey berries. The tree grows rapidly, more especially when once established and afterwards cut down, sometimes producing shoots six or eight feet in length. It is much used in the south of Italy and the south of France for planting squares and public walks. In a recently published Consular Report on the Agriculture and Industries of Piedmont, His Majesty's Consul gives the following particulars of the local interest in this tree.—The *bagolaro*, known in the United Kingdom under the name of nettle tree and Lote wood, grows naturally and plentifully in all the Alpine valleys of Piedmont, especially in the Stura Valley, where it is found on the mountain slopes as well as in the plain. It is also largely cultivated in the commune of Nole, particularly in that zone stretching along the left bank of the Stura River in the Lanzo Valley, and also, to a less extent, in the adjoining communes. The tree furnishes a compact, hard, heavy, and at the same time fibrous and elastic wood, practically unbreakable, a stick of which can be bent almost to a right angle without splitting. It is unaffected by inclement weather, very rarely attacked by woodworm and not liable to crack. For these qualities the stems or trunks are largely used for making whips, racquets, baskets, sticks, etc. It is said to be also adapted for carriage shafts and poles, chairs, etc. At Nole Canavese and neighbourhood, *bagolaro* is regularly cultivated as an industrial plant of considerable economic value, being grown on large tracts of land forming regular woods. When 10 or 12 years old, trees measure about 4 to 6 inches in diameter, but are never cut down until they reach at least $4\frac{3}{4}$ inches in diameter, this work being performed in winter.

The trunks thus obtained measure little less than 6 feet in length and weigh 55 to 77 lbs. avoir., the price being 16s. for ordinary trunks and £1 and £1 4s. for choice ones.

Whip making from *bagolaro* wood was introduced into Nole about the beginning of the last century by a certain Mr. Harley, and was continued and gradually improved by small local firms. At present it is carried out in regular factories employing some 300 workmen. Whips so made are exported into France, Spain,

Germany, Austria-Hungary, Belgium, North and South America, and even to Australia. They are sold at the following prices:—

	Price per dozen.						
	£	s.	d.		£	s.	d.
Common, plain	0	4	0	to	0	6	5
Better quality	0	5	7½		0	7	2½
Ornamented	1	0	0		1	4	0

J. M. H.

Arechavaleta, Las Gramineas Uruguayas.—This is a relatively scarce work, the systematic part of which appeared in the Anales del Museo Nacional de Montevideo, vol. i. (1894–1897). The latter was issued in six parts: part 1 consists of introduction and pages 1–78, and was printed by the firm of Dornaleche and Reyes; parts 2–6 were issued from the "Oriental" Press, and were printed in different type. The first instalment of Arechavaleta's memoir occupied pp. 29–78 of part 1, and was reprinted at the "Oriental" Press, apparently in order to have the whole of the memoir in the same type. This reprint was paged 29–92, and was issued without cover or title page. Part 2 of vol. i. continued the pagination of the reprint, and included pp. 93–212.

Arechavaleta's memoir contained numerous new species and combinations. Owing to the reprinting of the first instalment of it in larger type, those species which appeared in part 1 appeared on later pages of the reprint, and were taken up from the latter in *Index Kewensis*, Suppl. I. The index to vol. i. of the Anales also cites the pages of the reprint instead of those of part 1. The new names contained in parts 2 and 3 were quoted in *Index Kewensis*, Suppl. I. as appearing in volumes ii. and iii. of the Anales. Those included in parts 4–6 (1896–1897) were omitted from Suppl. II.

The following is a list of new species and new combinations contained in Las Gramineas Uruguayas. They will be inserted in *Index Kewensis*, Suppl. V.:—

Part 1 (1894).

Paspalum guenoarum, p. 50; reprint, p. 56.
,, *saltense*, p. 53; reprint, p. 59.
,, *uruguayense*, p. 54; reprint, p. 60.
,, *Larrañagai*, p. 60; reprint, p. 68.
,, *giganteum*, p. 62; reprint, p. 70.
,, *proliferum*, p. 63; reprint, p. 72.
,, *Arechavaletae*, p. 75; reprint, p. 86.
,, *enode*, p. 75; reprint, p. 87.
,, *dentatosulcatum*, p. 76; reprint, p. 88.

Part 2 (1894).

Anthaenantia Hackeli, p. 96; part 6, p. 555.
Panicum ramosum, p. 111.
,, *aequiglume*, p. 113.
,, *najadum*, p. 123.
,, *bambusoides*, p. 128; part 6, p. 555.
,, *Bergi*, p. 147.
Setaria caespitosa, p. 166.

Part 4 (1896).
Piptochaetum stipoides, p. 328.
,, *setosum*, p. 330.
Nassella trichotoma, p. 336.
Sporobolus subbulbosus, p. 343.
Agrostis pectinata, p. 347.
Danthonia cirrata, p. 367.
,, *montevidensis*, p. 369.
Part 5 (1896).
Spartina montevidensis, p. 378.
Chloris Canterai, p. 385.
,, *Berroi*, p. 388.
Pappophorum subbulbosum, p. 405.
Triodia Figueirai, p. 408.
,, *Hackeli*, p. 410.
Diplachne procumbens, p. 414.
Eragrostis trichocolea, p. 444.
,, *retinens*, p. 445.
Melica tenuis, p. 450.
Part 6 (1897).
Distichlis scoparia, p. 457.
Briza glomerata, p. 469.
Poa montevidensis, p. 479.
Bromus uruguayensis, p. 493.
Chusquea uruguayensis, p. 546.
Bambusa tacuara, p. 550.
Panicum Hackeli, p. 555.
Cenchrus scabridus, p. 556.

The following combinations, which were published as new by Arechavaleta, had already been made:—

Panicum nitidum, pp. 131, 556: *P. nitidum*, Lam.
Oplismenus compositus, pp. 160, 556: *O. compositus*, Beauv.
Pennisetum tristachyum, p. 219: *P. tristachyum*, Spreng.
,, *nervosum*, pp. 221, 556: *P. nervosum*, Trin.

M. L. G.

Agave sisalana and A. fourcroydes in Jamaica.—In a letter† read to the Board of Management of the Jamaica Agricultural Society on July 14th, 1914, the Hon. H. H. Cousins, Director of Agriculture, Jamaica, gives an interesting account of the growth of *Agave sisalana* on the limestone formation and of *A. fourcroydes*‡ on poor alluvial land deficient in lime, which should be studied by those interested in Sisal and Henequen. In British East Africa it would be possible to make a similar experiment in growing these two important fibre plants, and the experience gained in Jamaica is of great practical value:—

"I am desired by His Excellency to communicate to the Jamaica Agricultural Society the results of my recent observations as to

† *See* Journ. Jamaica Agric. Soc. xviii. August, 1914, No. 8, pp. 334-336.
‡ *A. fourcroydes*, Lemaire, *see* Trelease, Memoirs Nat. Acad. Sciences, xi. (1913), pp. 48, 49 t. 110-112. *A. rigida*, var. *elongata*, Kew Bull., 1892, p. 33.

*Agave fourcroydes** or Henequen and *Agave sisalana* or Sisal Hemp in Jamaica.

2. "The Departmental records show that one authenticated plant of Henequen was obtained from Kew in 1883 and planted at the Parade Garden. In 1886 the Colonial Secretary tried to secure a large consignment of Henequen plants from Yucatan through the British Consul at Progresso. The growers in Yucatan, however, refused to supply suckers, and the Consul was only able to send us 12 plants, which were set out at Hope Gardens.

"The Government of the Bahamas also at this time prohibited the export of suckers of the 'true Sisal' (*Agave sisalana*) so that Sir Henry Blake, who was very interested in this industry and desired to start it in Jamaica, was obliged to get suckers from the Caicos Islands. Some 23,000 of these were obtained and planted at Hope on an area of 30 acres now occupied by the Farm School. In 1891, 100,000 plants of *Agave sisalana* were obtained from Florida and distributed to the planters. The late Colonel Ward took most of these plants and set them out at Halse Hall, in Vere.

3. "The plants of *Agave sisalana* at Hope resulted in failure, as the plants poled at about two years and died before the leaves were fit for cutting. Owing to a marked fall in the price of Sisal Hemp fibre, Colonel Ward abandoned his enterprise and the industry was apparently quite dead by 1895.

4. "The recent success of Mr. Eric Anderson in the cultivation of *Agave sisalana* at the foot of the limestone hills above Morelands Estate, in Vere, has created a new interest in the Sisal Hemp industry. It is now demonstrated that the Sisalana will grow for several years without poling provided it be grown on its natural soil, which is that of a limestone formation.

"Mr. Anderson has also demonstrated that by cutting the leaves at three years instead of four years the plants are less liable to premature poling.

"There is a large supply of plants of *Agave sisalana* at present available in Jamaica, and it certainly merits the attention of planters who possess soils of limestone formation in the dry lowlands of the islands.

5. "My attention to the property of the Henequen (*Agave fourcroydes*) of not poling for a long time, even on a soil devoid of lime, was directed by the discovery by Mr. W. Harris, that a Henequen plant in the Parade Garden which poled in 1909 was apparently fourteen years old.

"The soil of the Parade Garden is a gravelly, alluvial deposit, very deficient in lime. Three plants of Henequen in the Cactus collection at Hope, which were set out in 1904 and are now ten years old, have not yet poled. It is, therefore, apparent that Henequen can be grown on dry, alluvial soils not of limestone formation without premature poling.

"There are large areas of dry, useless land in the Liguanea and St. Catherine plains that are at present almost useless for cultivation where Henequen should grow and yield profitable crops of fibre.

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* The spelling *fourcroydes* has been adopted instead of *fourcroides* in accordance with Trelease's Memoir.

6. "The two Henequen poles produced in the Parade Garden yielded about 7,000 plants, and these were presented to Hodges and Font Hill, in St. Elizabeth, and are now established on these properties. Mr. W. H. Griffiths, of Hodges, is extending his plantation of Henequen, and reports that the suckers supplied are growing well.

7. Mr. Stoddart, who wrote a bulletin on 'Sisal Hemp' for this Department in 1886, has recently rewritten this for the Journal of the Society, and holds a stock of about 100,000 plants of Henequen which are available to purchasers.

8. "In view of the interest and importance of the matter, I made an expedition recently into St. Catherine to investigate other possible sources of Henequen, and secured the services of Mr. W. Harris to assist me. We discovered Henequen plants growing freely along the main road near Old Harbour and saw many also growing in small holdings in this district, where they had been planted to make hedges.

9. "An interesting discovery was made when we called at the pen of Mr. Williams, near Old Harbour, where Henequen plants are a prominent feature of the frontage of the property.

"It was ascertained that a relative of this gentleman, named Ludford, about 60 years ago brought some Henequen plants to Jamaica from Yucatan and planted them on his property.

"Mr. Ludford must therefore be credited with the first introduction of *Agave fourcroydes* into Jamaica.

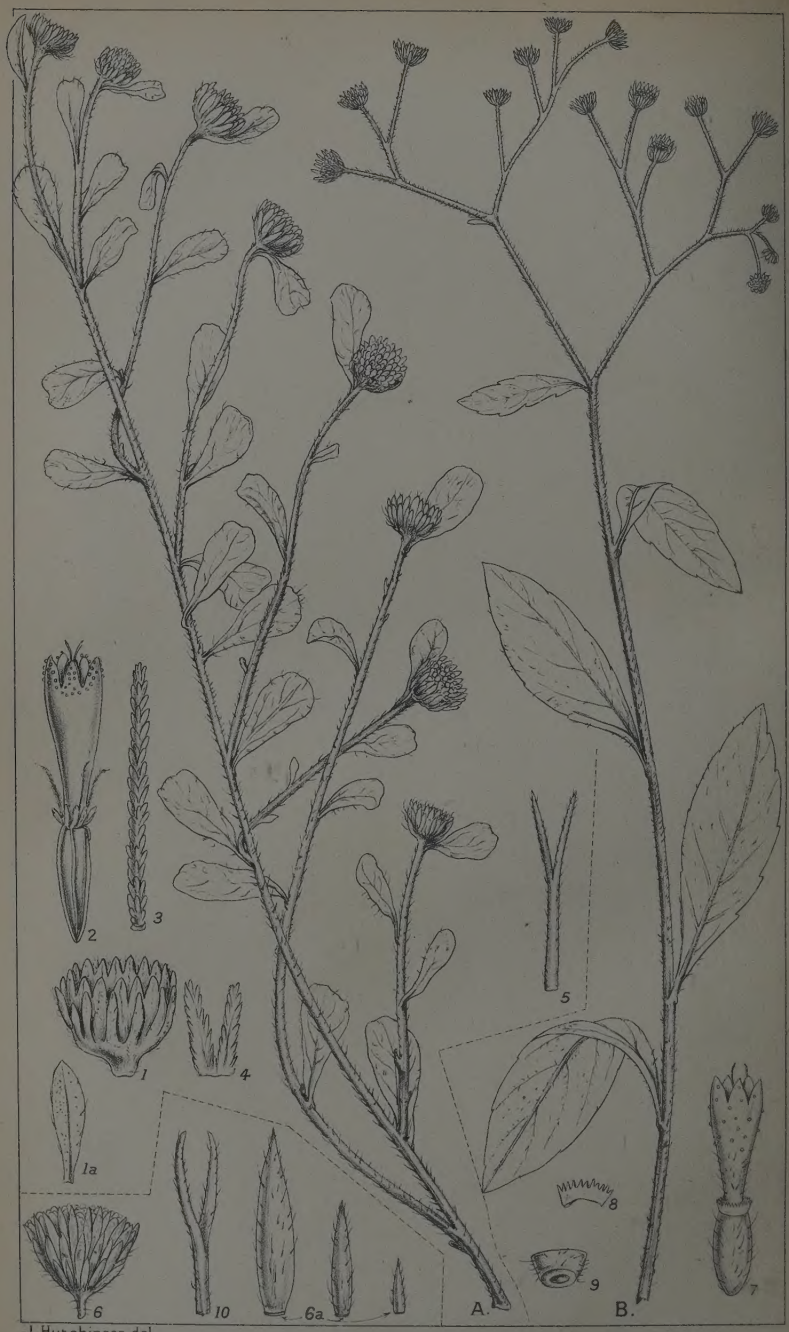
"When Colonel Ward was planting Sisal in Vere, I am informed he purchased poles of Henequen estimated to contain 20,000 bulbils from the stock introduced by Mr. Ludford for the sum of £5 per pole.

10. "We also discovered that Henequen growing near the residence of Mr. W. Watson, at Twickenham Park, near Spanish Town. Henequen has been planted on the limestone hills by the late Mr. A. Crum-Ewing, probably from suckers obtained from Hope Gardens. Mr. Watson has a very large run of land suitable for this culture and has decided to set out his plants of Henequen on an experimental plot of 5 acres.

11. "The Public Works Department has been requested by His Excellency to protect the Henequen plants now growing along the sides of the main roads in St. Catherine and to co-operate with us in securing the bulbils for planting when any of these plants pole.

12. "I believe that a large and lucrative industry can gradually be built up by the cultivation of Cauta Tree Cotton and Henequen on alluvial soils and of Cotton and true Sisal on the calcareous formations in dry and hot districts of the island.

"The special value of Henequen consists in its superiority for the purpose of making binder twine and the ever-growing demand for this material."



J. Hutchinson. del.

A. Herderia truncata.
B. Triplotaxis stellulifera.

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